JOURNAL *of* EDUCATIONAL RESEARCH

Volume XIII MARCH, 1926 Number 3

AGE DISTRIBUTION IN THE GRADES AS A MEASURE OF MENTALITY

HOWARD J. BANKER
Eugenics Record Office, Carnegie Institution of Washington

The fundamental norm which is sought to be established in the Binet test and in all its revisions may be stated in the formula: the test is to be so constituted that the mental age of the average child is expressed in terms of his chronological age. In a normal population the mean or median mental age as determined by a reliable test, therefore, equals the mean or median chronological age. Then assuming the test to be reliable, it follows that the median mental age of a school grade should equal the median chronological age in the same grade. If it does not, some factor has entered into the situation that acts as a selective agent. Such a disturbing factor may exist in the type of population from which the children are drawn, or it may arise from the administrative policy of the school. It does not necessarily indicate poor pedagogical principles or practices, but any considerable difference between the mental- and chronological-age medians would seem to demand investigation as to the cause.

A first important consideration is the determination of how nearly the medians in practice coincide with theory. Unfortunately the writer has been able to find but few published tables that give the necessary data for exact determinations. Dickson[1] has published precisely the material needed, but his work covers only the kindergarten and first grade. For more extensive comparison we must resort to indirect methods.

[1] Dickson, Virgil E. *Mental Tests and the Classroom Teacher.* Yonkers-on-Hudson, World Book Company, 1923. pp. 91, 96.

Dickson[2] has furnished a table of chronological-age distribution in all the eight grades of the schools of Oakland, California, for September, 1919, and through the courtesy of Robert K. Toaz, superintendent of schools, at Huntington, New York, I have been furnished with a similar chronological-age distribution table for the schools, of Rochester, New York, for September, 1916. What appeared to be reliable and comparable age medians for the grades of the Detroit[3] schools for September, 1921, were also obtained.

In the data of all three of the schools, the child's age is taken at the time of entrance in September and is reckoned as of the nearest half-year birthday, that is, if a child's seventh anniversary falls between June 1 and December 1 of the current year, he is reckoned as seven years old at entrance to school on September 1. If his seventh anniversary falls between December 1 and June 1 preceding, he is accounted as seven and a half years old at entrance in September.

From this material Table I has been compiled showing the deviation of the median chronological age of each grade from a norm determined by what is sometimes called the Rochester Rule, though this is nothing more than a formal statement of the theoretical tendency in the practice of many schools. The rule states that children are assumed to enter the kindergarten at the semester beginning nearest their fifth birthday and each succeeding grade at one-year intervals. It is immaterial if this rule is not strictly adhered to for it is only to serve as a convenient reference base.

From the data as given in Table I deviation curves for each of the three school systems were plotted as shown in Figure 1. It is to be noted at once that the age deviations of the Rochester

---

[2] *Op. cit.*, p. 11.

[3] Detroit Bureau of Statistics and Reference. "Age-Grade and Nationality Survey," *Detroit Educational Bulletin*, No. 7. January, 1922. 28 pp.

and Oakland school systems form a remarkably close blend with the exception of the first grade and a half. The Detroit deviation curve, however, is quite out of line and shows throughout a strongly marked over-ageness. If we omit from the Detroit data the foreign and colored elements, the curve settles back more closely to the Rochester and Oakland curves, but

TABLE I. DEVIATIONS OF THE MEDIAN CHRONOLOGICAL AGE PER GRADE IN THE SCHOOLS OF THREE CITIES FROM A NORMAL MEDIAN CHRONOLOGICAL AGE AT ENTRANCE IN SEPTEMBER BASED ON THE ROCHESTER RULE

Grade*	Normal Median Age	Rochester		Oakland		Detroit		Mean Deviation	
		Median	Dev.	Median	Dev.	Median	Dev.	Raw	Smoothed
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
I-B	6.0	6.17	.17	6.37	.37	6.54	.54	.36	.41
I-A	6.5	6.84	.34	7.13	.63	7.15	.65	.54	.48
II-B	7.0	7.22	.22	7.56	.56	7.79	.79	.52	.55
II-A	7.5	8.05	.55	8.07	.57	8.23	.73	.62	.62
III-B	8.0	8.53	.53	8.66	.66	8.92	.92	.70	.69
III-A	8.5	9.15	.65	9.11	.61	9.56	1.06	.77	.76
IV-B	9.0	9.64	.64	9.72	.72	10.11	1.11	.82	.82
IV-A	9.5	10.26	.76	10.13	.63	10.75	1.25	.88	.88
V-B	10.0	10.87	.87	10.78	.78	11.24	1.24	.96	.94
V-A	10.5	11.32	.82	11.32	.82	11.66	1.16	.93	.95
VI-B	11.0	11.85	.85	11.83	.83	12.14	1.14	.94	.94
VI-A	11.5	12.37	.87	12.24	.74	12.56	1.06	.89	.89
VII-B	12.0	12.83	.83	12.77	.77	13.01	1.01	.87	.84
VII-A	12.5	13.11	.61	13.20	.70	13.42	.92	.74	.79
VIII-B	13.0	13.70	.70	13.75	.75	13.83	.83	.76	.74
VIII A	13.5	14.16	.66	14.23	.73	14.16	.66	.68	.68
Mean Deviation		.63 ± .038		.68 ± .019		.94 ± .036		.75 ± .028	.75 ± .027

*Date and number of students for each survey: Rochester, September, 1916, 21,689; Oakland, September, 1919, 24,452; and Detroit, September, 1921, 109,076. The figures for Detroit include the kindergarten and can be regarded as only approximate since the totals vary in different tables.

even then it is distinctly higher as shown by its mean deviation of .74 as compared with .68 for Oakland and .63 for Rochester. Evidently some other factor than an excess of foreign and colored children affects the distribution.

To the three curves we may now fit the mean curve shown by the solid line. This is done by finding the mean deviation for each grade and then smoothing the curve of the resultant

distribution. The data thus obtained are given in the last two columns of Table I. The means with the probable errors, .75 ±.028 and .75 ± .027, show how closely the smoothed curve fits the mean distribution. Assuming that the three school systems which we have employed give typical age distributions, the fitted curve would represent approximately the true median chronological age per grade for the eight lower grades of our schools. On the average this is three-quarters of a year above the Rochester norm and a quarter of a year higher than the "mental-age standards" of Terman[4] or the standards "generally

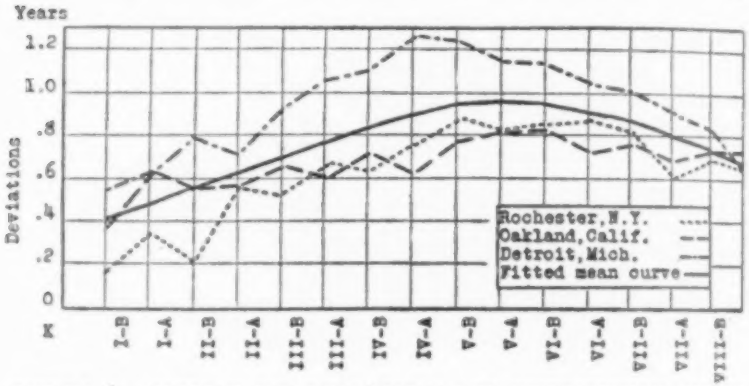

FIGURE 1. MEDIAN CHRONOLOGICAL-AGE DISTRIBUTION CURVES OF THREE SCHOOL SYSTEMS

accepted by educators" according to Stebbins and Pechstein.[5] The Rochester norm has the advantage of an abstract reference base, a mathematical zero, while to adopt for a reference standard a consensus of opinion or a variable average which is a function of every disturbing factor, is to veil from observation those fluctuations which are significant of the play of hidden forces. The significant fact, however, in the present instance is that the deviations are not uniform for all grades but vary characteristically in response to a definite law.

[4] Terman, Lewis M., Dickson, Virgil E., Sutherland, A. H., Franzen, Raymond H., Tupper, C. R., and Fernald, Grace. *Intelligence Tests and School Reorganization*. Yonkers-on-Hudson, World Book Company, 1922. p. 13.

[5] Stebbins, Rena, and Pechstein, L. A. "Quotients, I, E, and A." *Journal of Educational Psychology*, 13:385-98, October, 1922.

What relation now has the median mental-age distribution per grade to this chronological-age distribution? Unfortunately we know of no mental-age record for any of the three schools. It seems possible that such data may exist, at least for the Oakland schools. The best we can do is to employ the material furnished by Professor Terman in the work just cited.[6] He gives a table of the median mental age for each of the nine lower

TABLE II. MENTAL-AGE MEDIANS PER GRADE FROM VARIOUS AUTHORS

Grade	Normal Median	Kellam		Pintner		Terman		Raw Mean Dev.	Smoothed Mean Dev.	Fitted Line Dev.
		Test	Dev.	Test	Dev.	Test	Dev.			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
I	6.5	7.0	.50	7.08	.58	6.83	.33	.47	.47	.39
II	7.5	.....	.....	8.25	.75	7.92	.42	.47	.43	.43
II	(7.83)	8.08	.25	.....	.....	.....	.....	.....	.....	.....
III	8.5	.....	.....	8.58	.08	9.	.50	.36	.46	.46
III	(8.92)	9.42	.50	.....	.....	.....	.....	.....	.....	.....
IV	9.5	.....	.....	10.17	.67	9.92	.42	.54	.47	.50
V	10.5	.....	.....	11.04	.54	11.	.50	.52	.55	.53
VI	11.5	.....	.....	.....	.....	12.08	.58	.58	.56	.57
VII	12.5	.....	.....	.....	.....	13.08	.58	.58	.61	.61
VIII	13.5	.....	.....	.....	.....	14.17	.67	.67	.64	.64
Final means			.42		.52		.50 ± .024	.52 ± .021	.52 ± .017	.52 ± .020

grades, thus including the first high-school year, based on Binet tests of 1,936 unselected California children, and on the following page he gives "typical findings" from other investigators, of the "median mental age" in various grades. Such of this material as gives data for more than two grades is transformed into the equivalent years and decimals of a year and is entered in Table II with the deviations from the norm of the Rochester Rule to permit comparison with the chronological-age medians on the same basis.

It is to be noted that the intervals in this table are for full grades, year intervals, and not for half-grades, half-year intervals, as in the case of the chronological-age medians. It is evident, especially with these large intervals, that the "normal

[6] *Op. cit.*, pp. 14-15.

median age" values should be adjusted to the time of the school year at which the tests were given. In this table they are nearly all assumed to have been given at the mid-year. Terman supplies the standard ages "for the time of year that the tests were given," but only two of the tests given by Kellam appear to have

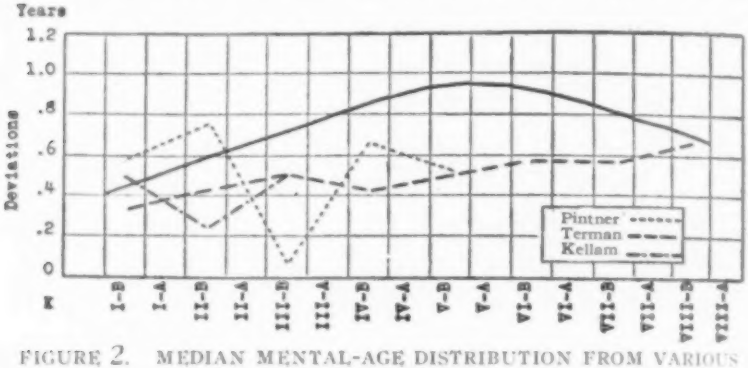

FIGURE 2. MEDIAN MENTAL-AGE DISTRIBUTION FROM VARIOUS AUTHORS, PLOTTED AS DEVIATIONS FROM THE NORM OF THE ROCHESTER RULE

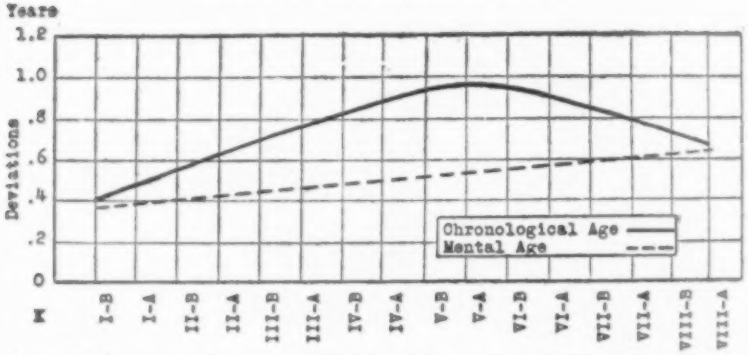

FIGURE 3. TYPICAL CHRONOLOGICAL-AGE DISTRIBUTION CURVE COMPARED WITH TYPICAL MENTAL-AGE DISTRIBUTION CURVE

involved any modification of the age standards on this account, and these adjustments have been entered in parentheses. The material is not in all respects ideal but may serve our purpose.

For comparison the deviations from the Rochester-Rule norm have been plotted on the mean median chronological-age curve derived from Figure 1 and again shown in Figure 2. The dotted

lines represent the distribution of the median mental ages per grade as found by the several investigators, while the solid line shows the mean curve of median chronological-age distributions. It is evident that the data are fragmentary and highly variable. The distribution obtained by Terman is the most complete and seems to be the most reliable. It is distinguished from the others as a broken line. It is the only material that covers the whole of the eight grades, and it is based on an average of 242 students per grade covering an unselected variety of schools in a large territory. Kellam's data are on an average of about 171 students per grade, and Pintner's on about 100.

We may proceed now, as with the chronological-age distributions, and determine the mean median for each grade as given in column 9 of Table II. Smoothing the distribution by Rugg's rule[7] we obtain the values given in column *10*. It is now apparent that the mean curve of the distribution is approximately a straight line. Adopting the mid-kindergarten grade and the Rochester-Rule norm as the origin of coordinates, we find the best fitting straight line to be:

$$y = .366 + .036x$$

The last column of Table II shows the points of this line corresponding to the mean mental-age median for each grade. Notice the frequent coincidence with points of the smoothed curve. The line is plotted in Figure 3 as the lower broken line. The figure thus shows graphically the true relations of these typical age distributions to each other.

We may observe, first, that there is in general a fundamental over-ageness in grade students as compared with the Rochester Rule. This amounts, on the average, to about a half-year in respect to mental age and about three-fourths of a year in respect to chronological age. This difference is mathematically shown by the final means in Tables I and II. It is evident also that the curve of deviations of chronological-age medians rises through the lower grades to a crest at about the fifth grade and

[7] Rugg, Harold O. *Statistical Methods Applied to Education.* Boston, Houghton Mifflin Company, 1917. p. 184.

then declines to the eighth grade, the right-hand branch of the curve is shorter and terminates at a higher level than the left branch. The straight-line curve deviations of mental-age medians rise gradually and continuously from the first to the eighth grades. The two curves approximate each other in the lowest and highest grades but diverge more or less in the middle grades.

All of these facts appear to have an explanation in the following considerations. The form of the upper curve, that for median chronological-age distribution, has been noted by others as characteristic of nearly all school systems and seems to be induced chiefly by the accumulation of repeaters in the middle grades, causing a corresponding rise of the median age per grade. By the time the sixth grade is reached many of these laggards are several years over-age and often have reached the age limit of compulsory education or have fallen so far behind their age associates who are entering the high school that they become discouraged, especially if lacking in mental ability for the work. They now begin to drop out of school with a consequent falling back of the curve toward the norm, but not as far as the level at which it started, since the dropping out does not wholly divest the highest grades of these over-age accumulations.

Now consider the effect of repeating or non-promotion on the mental-age medians. As the accumulation of retarded students in the grades tends to raise the chronological-age medians it will also raise proportionately the mental-age medians, if the students are all of normal or average intelligence, hence the mental-age curve should approximately follow the chronological-age curve. If, however, non-promotion is selective in any degree and the accumulation is not only of chronologically over-age students but at the same time is, for a considerable part, an accumulation of dull, mentally under-age students, the effect must be to depress the mental-age medians. The curves should in that case diverge, and the mental-age curve should tend to decline toward the base. Now the curves do diverge, but the mental-age curve apparently tends to rise throughout its whole course approximating a straight line at a fixed angle to the base.

The explanation would seem to be that there are two types of retardation which may be present in different school populations in different proportions. First, retardation without mental deficiency[8] induced by physical handicaps, sickness, changes of residence, family troubles, economic and social causes, not affecting the student's mentality, and, second, retardation with mental deficiency which is presumably its chief factor. Both types of retardation serve to raise the curve of chronological-age medians, but the curve of mental-age medians is raised by retardation without mental deficiency and is undisturbed or depressed by retardation with mental deficiency. There is, therefore, a divergence of the two curves proportionate to the amount of mental deficiency. After the fifth grade the dropping out of the mentally deficient students causes a convergence of the two curves until they again arrive at the normal condition of equal medians, but with both curves at a higher level, since retardation without marked mental deficiency is still effective, that is, it is chiefly the mental ineffectives who drop out. For this reason the mental-age curve is approximately a straight line continuously rising throughout the grades and probably through the high school and the college. Mentality of a higher order persists in spite of retardation from physical, social, or economic causes.

The question may here be raised as to the counteracting effects of acceleration. Since we are dealing with averages the medians are unaffected by any normal counterbalancing of retardation and acceleration. It is only the excess of one or the other that finds expression in the curves, and it is evident that these indicate a decided excess of retardation as shown by the fact of the rise of the curves. Presumably mental superiority is the only causal factor in student acceleration in the grades. At least we can conceive of no other likely to have any significant effect. Where acceleration is due to mental superiority it is

[8] It must be remembered that we are dealing with statistical concepts, and such an expression as "mental deficiency" is to be understood as meaning simply below the average.

evident that the effect is to lower the chronological-age median of the grade to which the student is promoted and the mental-age median of the grade that he leaves. The average effect is, therefore, to depress both curves, but there is no tendency to change the relation of the curves to each other.

We have seen that in a mentally normal population the two curves should coincide. The divergence of the curves, therefore, at any grade is a measure of the mean mental deficiency prevalent in that grade, and the mean divergence of the two curves for all grades is a measure of the mean mental deficiency within the school. These values may be given mathematical expression as the ratio of mental deficiency to retardation or over-ageness. It is to be noted that the expressions retardation and over-ageness, as well as acceleration, should be understood as used in a strictly statistical sense. A child who is only three months older than the median of his grade is statistically over-age. The attempt to combine pedagogical with statistical conceptions is to envelop the whole subject in a fog that often renders the significance of the results vague and obscure. Educators have been disposed to adopt broad definitions of "at age" and to modify their data "in the way of a concession to the child." Woodrow[9] has rightly emphasized the resultant concepts as "pedagogical age" and "pedagogical retardation."

The median mental deficiency, that is, the divergence of the curves at any point or grade is equal to the median chronological age of the given point or grade minus the median mental age at the same point, and the median retardation or over-ageness is equal to the median chronological age minus the selected norm for the given point or grade.

Let C = median chronological age,
M = median mental age, and
N = the chosen norm.

Then $\frac{C-M}{C-N}$ = percent of the total retardation or over-ageness in the given grade that is associated with mental deficiency.

[9] Woodrow, Herbert. *Brightness and Dullness in Children.* Philadelphia, J. B. Lippincott Company, 1919. 322 pp.

If the tables of age distribution are compiled as deviations from the norm, as has been the case in this work,

N becomes zero,

C becomes C_d, the deviation of the median chronological age from the norm,[10] and

M becomes M_d, the deviation of the median mental age from the norm. Then

$$100\left(1-\frac{M_d}{C_d}\right)=\%$$

If $M_d = 0$,

$$1-\frac{M_d}{C_d}=100\%,$$

that is to say, the median mental age then coincides with the norm, and all retardation or over-ageness is associated with mental deficiency.

If $M_d = C_d$,

$$1-\frac{M_d}{C_d}=0\%,$$

the medians here coincide, and there is no excess or unbalance of mental deficiency in the grade.

If $M_d > C_d$,

$$1-\frac{M_d}{C_d}=\sigma, \text{ a negative quantity.}$$

In such cases the retardation or over-ageness has no relation to mentality. Negative values should be rejected in determining the ratio of mental deficiency to total retardation for the school.

Since in Table II the mental-age medians are given for full grades, year intervals, before applying the formula it is desirable to determine the deviation from the norm of the mental-age medians for each half-grade, or half-year intervals, that they may be comparable with the chronological-age medians for half-grades. As the typical mental-age distribution is essentially the straight line

$$y = .366 + .036x$$

the deviations may be readily computed. The origin is taken at the mid-kindergarten grade and for the abscissas or x values

[10] *See* Column *10* of Table I.

a half-year is counted for each half-grade, the ordinate y is then the mental-age deviation (or M_d) for each half-grade. The computation and its results are given in Table III.

We may now apply the formula,

$$100\left(1-\frac{M_d}{C_d}\right)=\%,$$

for determining the percent of mental inferiority among re-

TABLE III. MEDIAN MENTAL AGES PER GRADE AT ENTRANCE AS DETERMINED FROM THE FITTED STRAIGHT LINE OF A TYPICAL MENTAL-AGE DISTRIBUTION

Formula: $y = .366 + .036x$

Grade	x		Mental-Age Deviation y (or M_d)	Rochester Norm	Mental Age at Entrance M = Median
(1)	(2)	(3)	(4)	(5)	(6)
I-B	.5	.366 + .018	.384	6.0	6.38
I-A	1.0	.366 + .036	.402	6.5	6.90
II-B	1.5	.366 + .054	.420	7.0	7.42
II-A	2.0	.366 + .072	.438	7.5	7.94
III-B	2.5	.366 + .090	.456	8.0	8.46
III-A	3.0	.366 + .108	.474	8.5	8.97
IV-B	3.5	.366 + .126	.492	9.0	9.49
IV-A	4.0	.366 + .144	.510	9.5	10.01
V-B	4.5	.366 + .162	.528	10.0	10.53
V-A	5.0	.366 + .180	.546	10.5	11.05
VI-B	5.5	.366 + .198	.564	11.0	11.56
VI-A	6.0	.366 + .216	.582	11.5	12.08
VII-B	6.5	.366 + .234	.600	12.0	12.60
VII-A	7.0	.366 + .252	.618	12.5	13.12
VIII-B	7.5	.366 + .270	.636	13.0	13.64
VIII-A	8.0	.366 + .288	.654	13.5	14.15

tarded children. Assuming our curves to be typical, we find that nearly 30 percent of statistically retarded children are below average mentality. The details of this computation are given in Table IV. It is seen that the proportion of mentally inferior children is least in the first and eighth grades and accumulates to a maximum in the fifth. For purposes of exact comparison, however, the computation of both mental- and chronological-age deviations should be made on the same body of students, and to

determine with accuracy the general conditions throughout the country a much larger body of data ought to be employed.

Since the difference between the median mental age and the median chronological age is a measure of the mental deficiency of a grade, it seems to follow that on the average a student whose chronological age is greater than the median chron-

TABLE IV. COMPUTATION OF PERCENT OF TOTAL RETARDATION ASSOCIATED WITH MENTAL INFERIORITY IN A TYPICAL SCHOOL SYSTEM

Formula: $100\left(1-\frac{M_d}{C_d}\right)=\%$

Grade	C_d From Table I	M_d From Table III	$\frac{M_d}{C_d}$	Percent of Mental Inferiority
(1)	(2)	(3)	(4)	(5)
I-B	.41	.38	.93	7
I-A	.48	.40	.83	17
II-B	.55	.42	.76	24
II-A	.62	.44	.71	29
III-B	.69	.46	.67	33
III-A	.76	.47	.62	38
IV-B	.82	.49	.60	40
IV-A	.88	.51	.58	42
V-B	.94	.53	.56	44
V-A	.95	.55	.58	42
VI-B	.94	.56	.60	40
VI-A	.89	.58	.65	35
VII-B	.84	.60	.71	29
VII-A	.79	.62	.78	22
VIII-B	.74	.64	.86	14
VIII-A	.68	.65	.96	4
Mean	$.75 \pm .027$	.52		28.75%

ological age of the grade must have a mental age not greater than the median mental age of the grade. In other words, as a rule, if a child's over-ageness is greater than the average of his class, his mentality is less than the average of his class. In that case we may assume that his intelligence quotient will not exceed the ratio of the median mental age of his class to his own chronological age. On this basis we may determine the chronological-

age limits per grade of a given intelligence quotient. The formula will be, the ratio of the median mental age to the intelligence quotient equals the minimum or maximum chronological age for the grade according as the intelligence quotient is less or greater than unity. By means of this formula we have compiled Table V, giving the chronological-age limits per grade for students with intelligence quotients of less than 80 or more than

TABLE V. CHRONOLOGICAL-AGE LIMITS PER GRADE FOR STUDENTS WHOSE INTELLIGENCE QUOTIENTS ARE LESS THAN 80 OR MORE THAN 120

Grade	*M* or Median Mental Age (From Table III)	I. Q. of 80 or Less		I. Q. of 120 or More	
		Minimum Chronological Age	Over-Age Deviation from Norm	Maximum Chronological Age	Under-Age Deviation from Norm
I-B	6.38	7.97	1.97	5.32	.68
I-A	6.90	8.62	2.12	5.75	.75
II-B	7.42	9.27	2.27	6.18	.82
II-A	7.94	9.92	2.42	6.62	.88
III-B	8.46	10.57	2.57	7.05	.95
III-A	8.97	11.21	2.71	7.47	1.03
IV-B	9.49	11.86	2.86	7.91	1.09
IV-A	10.01	12.51	3.01	8.34	1.16
V-B	10.53	13.16	3.16	8.77	1.23
V-A	11.05	13.81	3.31	9.21	1.29
VI-B	11.56	14.45	3.45	9.63	1.37
VI-A	12.08	15.10	3.60	10.07	1.43
VII-B	12.60	15.75	3.75	10.50	1.50
VII-A	13.12	16.40	3.90	10.93	1.57
VIII-B	13.64	17.05	4.05	11.37	1.63
VIII-A	14.15	17.69	4.19	11.79	1.71

Formulas: I. $\frac{M}{80}$ = minimum chronological age.

II. $\frac{M}{120}$ = maximum chronological age.

120. According to Terman[11], Kuhlmann[12] and others, I. Q.'s of 80 or below indicate presumptive feeble-minded or borderline cases, and I. Q.'s of 120 or above belong to the group of "superior intelligence."

[11] Terman, Lewis M. *The Measurement of Intelligence.* Boston, Houghton Mifflin Company, 1916. p. 79.

[12] Kuhlmann, F. *A Handbook of Mental Tests.* Baltimore, Warwick and York, 1922. p. 16.

Our table indicates that a child of eight who is able to do only average work in the first grade is presumably of low mentality, less than 80 I. Q. and near or quite feeble-minded, as is also a child of thirteen who is only able to enter the fifth grade, or a child of seventeen in the eighth grade. Likewise a child of less than five and a half who is able to do the first-grade work is of superior intelligence, that is an I. Q. of over 120, as is also a child capable of entering the third grade before he is seven years of age or the seventh grade before he is ten and a half.

The column headed *Deviation from the norm*, under each intelligence quotient furnishes a graduated scale of mean retardation or acceleration for each grade on the basis of the given intelligence quotients. It may be noted that children with an I. Q. of 80 on the average show a retardation or over-ageness of about two years in the first grade, gradually increasing to about twice that amount or four years when the eighth grade is reached.

In this connection it is of interest to note, as Terman[13] informs us, that Binet suggested "the rule that while retardation of two years usually means feeble-mindedness in children under ten years of age, older children should not be regarded as feeble-minded unless retarded as much as three years." To which Terman adds the comment, "this is obviously crude, but Binet did not suggest any more definite adjustment to allow for the decreasing significance of a given amount of retardation in the upper years." The table already described supplies the graduated scale for such definite adjustment, and it is especially interesting to observe that the three years of retardation or over-ageness falls at just about the ten-year age period.

As shown by the last column in the table, the acceleration of superior students is likewise graduated from the lowest to the highest grades and with a relative range distinctly greater than that for the lower intelligence quotient, acceleration for the

[13] Terman, Lewis M., and others. *The Stanford Revision and Extension of the Binet-Simon Scale for Measuring Intelligence.* Baltimore, Warwick and York, 1917. p. 51.

eighth grade being two and a half times that of the first grade, but the deviations from the norm are little more than a third of the deviations for the lower intelligence quotients, hence the differences are less conspicuous in practice. For this reason, possibly, educators working largely from empirical criteria have not fully appreciated the significance of small accelerations with superior students. It is evident that achievement increases with a diminishing increment as the intelligence quotient increases. This may be simply a mathematical function of the Binet method of measuring intelligence.

IS CLASSIFICATION BY MENTAL AGES AND INTELLIGENCE QUOTIENTS WORTH WHILE?

T. L. TORGERSON
University of Wisconsin

The advantages of classification have been generally accepted both in theory and in practice. There is a growing tendency at the present time, however, to consider the classification of pupils merely as an administrative device preceding a more complete program of differentiation. During the present period of adjustment when the matter of differentiation of curricula, differentiation of progress, and individual instruction are in the foreground, it may not be amiss to evaluate some objective evidence relating to the general problem of classification and grade placement of pupils.

Classification is not an end in itself. But if pupils are classified with no further differentiation of progress or of curricula, can we expect any measurable gain in educational efficiency? This article attempts, in part, to answer this question.

The term classification here means the grouping of pupils within a given grade into sections according to ability; intelligence quotients and educational quotients are used as bases for classification. Classification according to mental age and educational age will be specifically referred to as "grade placement."

The effect of classification upon pupil promotion will first be considered.[1] Do classification and proper grade placement of pupils reduce failures? Table I offers some objective evidence. Grade placement on the basis of mental age and educational age was limited to the first six grades; reference to the table shows a greater reduction of failures in the elementary grades. The percent of failures after classification represents the average over a period of three years. These results indicate that better classification and the proper grade placement of pupils did materially reduce failures.

[1] The data used are taken from the schools of West Allis, Wisconsin, during part of the time when the writer was Director of Educational Measurements.

To make a fair comparison of failures the standards for promotion during the two periods should be kept constant, for failures during the period of classification could have been easily reduced had the standards for promotion been lowered. The opposite, however, represents the real situation. During the period of classification while no differentiation was made in the course of study or the progress rates of the pupils, the achievement levels, as measured by standard tests, were raised more than one semester. These results were secured without any loss in the time given to the so-called cultural subjects. Consequently

TABLE I. PERCENT OF FAILURES BEFORE AND AFTER CLASSIFICATION AND THE PERCENT OF REDUCTION

Grades	Number of Pupils	Before Classification	After Classification	Reduction
(1)	(2)	(3)	(4)	(5)
I-VI	2,500	12.2	7.0	40.9
VII-IX	686	16.0	13.0	18.7

the real difference in favor of classification was even greater than the data indicate. The personnel of the teaching staff during the two periods was practically the same. A greater amount of remedial work was done during the latter period, however. Remedial work will undoubtedly tend to reduce failures, but the writer feels that the success of any such program is in direct ratio to the homogeneity of the groups.

The reduction of mental under-ageness and over-ageness for each grade in order to reduce educational retardation and acceleration is an important index of the efficiency of a school. Table II indicates what was accomplished in such reduction by a more scientific grade placement of the pupils; mental over-ageness of three years was reduced 73 percent; of two years, 55 percent; and of one year, 24 percent.

The extreme cases of mental and educational over-ageness were adjusted by means of double promotions; 346 pupils were given extra promotions. The total educational gain was 409

semesters, representing an average gain of one year for 204 pupils or six years for 34 pupils. Not a single failure resulted, and in practically every instance the pupils thus accelerated not only did better work but were leaders in their classes.

That better grade placement and classification of pupils reduced educational retardation and resulted in a better educational

TABLE II. REDUCTION OF MENTAL OVER-AGENESS AND UNDER-AGENESS IN ONE YEAR AS A RESULT OF MORE SCIENTIFIC GRADE PLACEMENT

	Percent		
	One Year	Two Years	Three Years
(1)	(2)	(3)	(4)
Over-ageness	24	55	73
Under-ageness	27	17	15

TABLE III. COMPARISON OF RESULTS OF THORNDIKE-MCCALL SILENT READING SCALE IN WEST ALLIS AND WISCONSIN

	Number of Pupils	Percent		
		Retarded More Than One Year	Normal	Accelerated More Than One Year
(1)	(2)	(3)	(4)	(5)
West Allis	1,222	7.2	82.8	10
Wisconsin	4,327	23.9	61.6	14.5

product are brought out by the data shown in Table III. The results of the Thorndike-McCall Reading Tests in grades III to VI in the West Allis schools were compared with results secured from the same test in similar grades in a state-wide survey made by the State Department of Educational Measurements. While 61.6 percent of the pupils in the state had normal reading ability for the grade in which they were located, 82.8 percent of the pupils in West Allis had normal reading ability for their grade. This is directly due to the better classification and grade placement of the West Allis pupils.

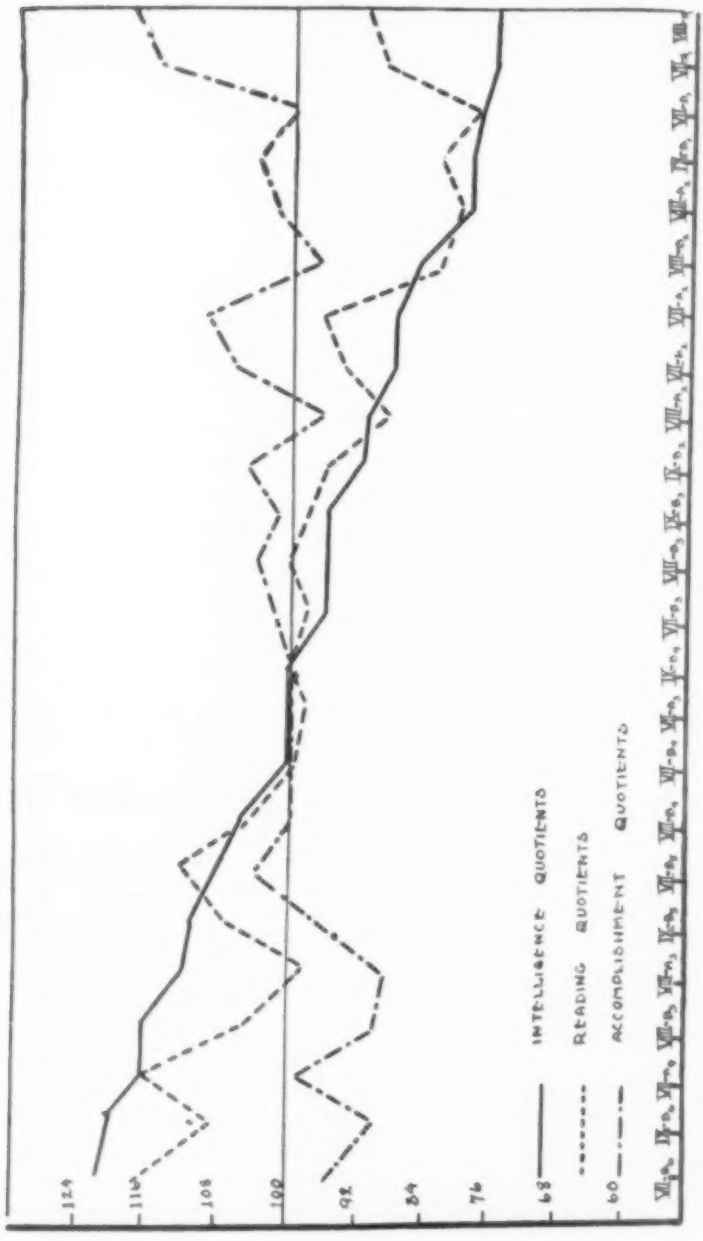

FIG. 1. MEDIAN READING QUOTIENTS AND ACCOMPLISHMENT QUOTIENTS IN COMPARISON WITH MEDIAN INTELLIGENCE QUOTIENTS. 680 PUPILS. THORNDIKE-MCCALL READING TEST, OCTOBER, 1922

The relationship existing between intelligence quotients and reading quotients is shown by Figure 1. The various sections of junior high-school pupils are here arranged from highest to lowest in the order of median intelligence quotients. The curve starts with section VII-B_6 with a median intelligence quotient of 122 and descends to sections VII-A_1 and VIII-B_1 with median intelligence quotients of 76.

The median reading quotient of VII-B_6 was 117 with a resulting accomplishment quotient of 95, while sections VII-A_1 and VIII-B_1 with reading quotients of 89 and 91 have accomplishment quotients of 116 and 119 respectively. A glance at the three curves brings out the following facts: pupils with high intelligence quotients tend to have low accomplishment quotients and pupils of low intelligence quotients tend to have high accomplishment quotients, while pupils with normal intelligence quotients tend to have accomplishment quotients of about 100. Only sections VII-A_4, VIII-B_2, and VII-B_1 tend to deviate from this general principle.

What are the reasons for this situation? Shall we dismiss the problem by saying bright pupils tend to be lazy and dull pupils tend to be industrious? Granting some truth in this we must determine whether the industry on the part of dull pupils and lack of industry on the part of bright pupils is an artificial condition produced by our present system of promotion. Are the pupils of high intelligence quotient inherently lazy, or are they educationally retarded because they have not had an opportunity to come in contact with work on their real level of ability? If the latter condition is true would not this school environment tend to produce habits of indolence? Are the pupils of low intelligence quotients industrious by nature or are they accelerated educationally for their real ability because they have consistently been drilled on material above their level of ability? The pupils of normal intelligence quotient are more likely to be found in their proper grade. Would it not be logical to expect a normal efficiency? By combining the various sections of the junior high school into three intelligence-quotient groups denoting dull, nor-

FIG. 1. MEDIAN READING QUOTIENTS AND ACCOMPLISHMENT QUOTIENTS IN COMPARISON WITH MEDIAN INTELLIGENCE QUOTIENTS. 680 PUPILS. THORNDIKE-MCCALL READING TEST, OCTOBER, 1922

mal, and bright pupils the tendency indicated above becomes apparent. This is shown by Table IV.

In order to throw further light on the situation a study was made of all pupils with a mental age of twelve years, that is from

TABLE IV. ACCOMPLISHMENT QUOTIENTS BASED UPON THE THORNDIKE MCCALL READING TEST IN THE JUNIOR HIGH SCHOOL

Intelligence Quotient	Accomplishment Quotient
(1)	(2)
Below 90	106.7
90–109	101.3
Above 109	93.1

TABLE V. RELATION OF INTELLIGENCE QUOTIENTS AND ACCOMPLISHMENT QUOTIENTS TO GRADE LOCATION—THORNDIKE-MCCALL READING TEST

Grade	Number of Pupils	Intelligence Quotient	Accomplishment Quotient
(1)	(2)	(3)	(4)
III-A	2	120	87.5
IV-B	6	128	94
IV-A	10	113	96.5
V-B	26	115	102.5
V-A	37	110	104
VI-B	20	100	105.5
VI-A	36	97	107
VII-B	30	94	108
VII-A	14	87	115.5
VIII-B	16	83	108
VIII-A	6	82	103
IX-B	13	82	110

eleven years six months to twelve years five months, within the school system. All pupils of the same mental age were selected in order to keep the ability of the pupils constant and to consider the reasons for the variability in efficiency as determined by their accomplishment quotients. Table V gives the grade location, average intelligence quotient, and average accomplishment quotient of these mental twelve-year-olds.

Table V indicates that the same relationship exists in the elementary school between intelligence quotients and accomplishment quotients as was found in the junior high school. When we consider the grade placement of the pupils of twelve-year mentality we find that the high intelligence quotients appear in the lower grades and the low intelligence quotients in the upper grades. This suggests that the possible reason for a low accomplishment quotient accompanying a high intelligence quotient is the greater lack of educational opportunity for the bright pupil as compared with the pupil of normal intelligence.

In order to secure a more comprehensive rating of the efficiency of the pupils we shall consider the accomplishment quotient based upon a comparison of the mental age and the educational age as measured by the Stanford Achievement Test. All the pupils in grades III-B to VI-A are considered. Table VI indicates this criterion used as a basis for proper grade placement. Thus a pupil is considered properly placed for his ability if he is in III-B and has a mental age between eight and nine years. According to the above criterion for grade placement, all pupils in grades III-B to VI-A were classified into three groups as follows:

TABLE VI. PROPER GRADE FOR MENTAL AGE

Grade	Mental Age
(1)	(2)
III-B	8-0 to 9-0
III-A	8-6 to 9-6
IV-B	9-0 to 10-0
IV-A	9-6 to 10-6
V-B	10-0 to 11-0
V-A	10-6 to 11-6
VI-B	11-0 to 12-0
VI-A	11-6 to 12-6

Group I.—Pupils, retained in grades below the level for their mental age, are retarded educationally for their ability.

Group II.—Pupils, placed in grades on the level of their mental age, are normal educationally for their mental ability.

Group III.—Pupils, advanced to grades above the level of their mental age, are accelerated educationally for their mental ability.

The pupils that were normally placed had a median accomplishment quotient of 107.2. The pupils of Group I, those placed in grades below their level of ability, had a median accomplishment quotient of 99.8. The pupils that had been promoted to grades beyond their level of ability had a median accomplishment quotient of 117.8. These data present rather conclusive evidence that when pupils are placed in grades below their level of ability the result is a lowering of efficiency as represented by the accomplishment quotient. This is self-evident when we consider that a pupil in the fourth grade with sixth-grade ability must be able to do sixth-grade work in arithmetic in order to

TABLE VII. EFFECT OF GRADE PLACEMENT UPON THE ACCOMPLISHMENT QUOTIENTS IN GRADES III-B TO VI-A STANFORD ACHIEVEMENT TEST

Group	Educational Status	Number of Pupils	Accomplishment Quotient		
			Q_1	M	Q_3
(1)	(2)	(3)	(4)	(5)	(6)
I	Retarded	339	94.7	99.8	104.7
II	Normal	365	103.2	107.2	112.9
III	Accelerated	375	113.2	117.8	123.2

raise his arithmetic age to the sixth-grade level and have a normal accomplishment quotient. As the pupils of high intelligence quotient are younger chronologically, their advancement on the basis of their chronological age will result in a mental overageness for their grade and a concomitant lack of educational opportunity.

The argument may be proposed that it seems advisable to place pupils in grades above their mental level, since such classification will yield a high accomplishment quotient. It is true that pupils in the sixth grade who are of fourth-grade ability, because of the drill they receive upon material above their real level of ability, may be able to master some of the fundamentals in the fifth and sixth grades and thus raise their educational level slightly above the fourth grade. This results in an accomplishment quotient above normal. On the other hand, the pupils in

question are not doing satisfactory fifth- or sixth-grade work; a large percent are repeaters and are out of harmony with school work in general.

Table V indicates clearly that pupils of low intelligence quotient with a mental age of twelve years are in the upper grades and have high accomplishment quotients. The pupils of high intelligence quotients with a mental age of twelve are in the lower grades and have low accomplishment quotients. Table VII points out that pupils in grades III to VI who are placed in grades above their level of ability have high accomplishment quotients, while pupils who are placed in grades below their level of ability have low accomplishment quotients.

TABLE VIII. AVERAGE ACCOMPLISHMENT QUOTIENTS FOR DULL, NORMAL, AND BRIGHT PUPILS PROPERLY GRADED ON THE STANFORD ACHIEVEMENT TEST IN GRADES IV AND V

Group	Intelligence Quotient	Number of Pupils	Accomplishment Quotient
(1)	(2)	(3)	(4)
I	Below 90	41	107.6
II	90–109	169	109.3
III	110 upwards	16	111.9

All of the pupils in the fourth and fifth grades who were properly placed, according to the criterion set forth in Table VI, have been classified into three intelligence-quotient groups denoting dull, normal, and bright pupils. The average accomplishment quotient for each group was computed. The results are summarized in Table VIII showing the relationship which exists between the intelligence quotient and the accomplishment quotient.

From the data in Table VIII we find no evidence for the theory of an inherent lack of industry on the part of the bright pupils. The data indicate rather conclusively that when pupils are properly graded the inverse relationship between intelligence quotient and accomplishment quotient disappears. In other words, when pupils are given educational opportunity equal to their ability, the bright pupils are not only as efficient as the

dull pupils but actually tend to have an advantage over the pupils of the same mental age but of a lower intelligence quotient. In this table we find that the average accomplishment quotient of the dull pupils was 107.6, in comparison with an average accomplishment quotient of 111.9 for the bright pupils.

From this study we may conclude that the classification of pupils in homogeneous groups according to ability tends to reduce failures. Proper grade placement and classification reduce maladjustments and mental and educational over-ageness and underageness, and result in a better educational product. Proper grade placement also tends to raise the accomplishment quotient of all pupils to a normal maximal efficiency. A more scientific classification and grade placement of pupils seems therefore a valid objective.

HANDWRITING SURVEY TO DETERMINE GRADE STANDARDS

JOHN G. KIRK
Director, Commercial Education, Philadelphia Public Schools

One of the first educational scales developed for the measurement of subject-matter was that for handwriting. Since 1910 considerable progress has been made; the scales now available are accurate enough to be used in an attempt to establish standards which will be practical and unbiased. Many and varied investigations of writing problems have been made by Thorndike, Ayres, Freeman, Downey, Graves, Judd, Starch, and others. These have included such problems as attainments in speed and quality, scales, sex differences in speed and quality, correlation of writing with other traits, correct slant, economical length of practice period, and methods. Koos, in 1918, published a study of the social and vocational demands of handwriting. Much of the present investigation was conducted along trends similar to those of Koos but was limited to the conditions in Philadelphia.

The psychological effect of definite standards in any subject is highly beneficial to both pupil and teacher. Each individual wants to know how much is expected of him and how near he is to the goal. Standards may also furnish a means of comparing the value of methods of teaching or of learning. Since standards may play so important a part, special care should be taken to see that scientific methods are employed in their determination.

The standards of attainment in any subject should be both reasonable and adequate for the different grades and should take into consideration what the average child can do under specified school conditions. The theoretical idea of perfection is being adapted to the demands for quantity, speed, conservation of energy, and the social needs for the ability in question.

The primary purpose of this survey was to determine the quality of handwriting necessary to meet the social and business

demands and to determine therefrom standards of attainment for the sixth and eighth grades. This led to an investigation of the quality of handwriting necessary for social correspondence and for vocational purposes. The secondary purpose was to re-emphasize the needs in types of handwriting studied, for teachers in general, and those of Philadelphia in particular.[1]

Quality of Handwriting Necessary for Social Correspondence

The portion of the survey concerned with the determination of the quality standard for social correspondence involved the securing of one thousand specimens from among the letters of adults. The sex and occupation of the writers were recorded. The samples were then rated on the Ayres Measuring Scale for Handwriting, Gettysburg Edition, in steps of 5. The rating was for legibility only; other characteristics such as size, slant, style, or individuality were not considered except as they affected legibility. No account was taken of the time consumed in writing the specimens nor of the energy expended. They were obtained as follows:

Two hundred and fifty specimens were clipped from the social correspondence of students of the classes of Surveys and Measurements, University of Pennsylvania.

Two hundred and fifty specimens were taken from the social correspondence of students of the classes of Surveys and Measurements, Temple University.

Two hundred and fifty specimens were obtained from the social correspondence of advanced students in handwriting, Philadelphia Normal School.

Two hundred and fifty specimens were gathered from the social correspondence of supervisors of handwriting in Philadelphia public schools.

Five judges were selected from each group to rate the one thousand specimens on the Ayres Handwriting Scale. Each

[1] In making this survey, I was assisted at every stage of the work by the handwriting supervisors of the staff of the Division of Commercial Education of the Department of Superintendence of the public schools of Philadelphia. I wish to acknowledge my especial indebtedness to Mr. H. A. Rouse, Miss Catherine Boyle, and Miss Margaret McCausland, the members of the staff who not only assisted in planning the study, but who also did the major portion of the detailed work involved in its completion.

specimen, therefore, was rated twenty different times, and the average score of each was obtained. The occupation, sex, and general averages of each writer were then determined and tabulated.

Column *2* of Table I summarizes the variety of occupations from which the writers of the specimens of social correspondence came. Group *4* includes specimens written by clerks, stenographers, bookkeepers, accountants, merchants, and business managers; Group *9*, elementary, high-school, and university teachers, superintendents, principals, and others interested in educational work; Group *10*, those engaged in the engineering profession as civil engineers and electrical engineers; Group *13*, women who manage homes for remuneration; Group *25*, students in normal schools, colleges, and universities. Group *26* includes representatives from many occupations as a motion-picture actress, a manicurist, a baker, a radio operator, those for whom no occupation was reported, and people of leisure.

The occupational distribution of the scores of social handwriting is shown in Table I. The occupational average quality is given in column *21*. The figures at the bottom of the columns indicate the number of all specimens receiving quality scores from 10 to 90; the average quality of the one thousand specimens of social handwriting is 47.1.

A study and comparison of the occupational averages show that clergymen are the lowest group, with an average quality of 35.1, which is 12.0 points below the general average. The physicians are next with an average quality of 35.9. Soldiers write better than sailors or lawyers, while the handwriting of farmers is better than that of physicians, who write but .8 points higher than clergymen. Housekeepers are highest, with a score of 51.4, which is 4.3 points above the general average. The number of specimens in certain of these groups, however, is too small to justify final conclusions. Business workers, educational workers, homemakers, and students, representing more than 70 percent of the specimens with a combined average of 49.2, are all above the general average of 47.1. Although the range of distribution for the four groups just mentioned is wide, probably due to the

TABLE I. DISTRIBUTION AND SCORES OF THE SPECIMENS OF SOCIAL CORRESPONDENCE

Vocations	Group	Number of Specimens	Distribution on Ayres Scale, Gettysburg Edition																	Average Quality
			10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Architects	1	4	....	....	....	....	1	....	1	1	....	1	....	....	....	....	....	....	....	43.7
Artists	2	10	....	....	....	....	1	4	2	....	1	1	1	....	....	....	....	....	....	41.8
Authors and journalists	3	5	....	....	....	....	1	....	....	....	1	1	2	....	....	....	....	....	....	48.3
Business workers	4	230	....	2	2	5	11	14	32	38	53	31	15	12	6	5	3	1	....	48.7
Chemists	5	3	....	....	....	....	....	2	1	....	....	....	....	....	....	....	....	....	....	38.0
Clergymen	6	20	1	....	1	4	2	3	4	3	....	2	....	....	....	....	....	....	....	35.1
Club and society women	7	8	....	....	....	1	2	....	1	1	....	2	....	....	....	1	....	....	....	45.4
Dressmakers	8	5	....	....	....	....	....	1	2	....	1	....	1	....	....	....	....	....	....	46.8
Educational workers	9	202	....	....	1	5	13	10	26	38	21	27	19	11	10	5	9	6	1	51.1
Engineers	10	14	....	....	....	....	....	4	2	1	3	3	....	1	....	....	....	....	....	47.7
Farmers	11	10	....	....	....	....	3	2	3	1	1	....	....	....	....	....	....	....	....	37.8
Homemakers	12	115	....	....	1	3	10	10	23	22	14	10	9	2	8	2	1	....	....	47.2
Housekeepers	13	7	....	....	....	....	1	1	....	1	1	1	1	....	1	....	....	....	....	51.4
Laborers	14	11	....	....	....	1	....	1	2	....	3	2	1	1	....	....	....	....	....	47.7
Lawyers	15	17	....	....	1	1	2	5	2	2	....	3	....	1	....	....	....	....	....	39.7
Librarians	16	5	....	....	....	....	....	....	2	1	1	1	....	....	....	....	....	....	....	44.5
Mechanics	17	7	....	....	1	1	....	....	1	3	....	....	1	....	....	....	....	....	....	39.2
Milliners	18	3	....	....	....	....	1	....	1	....	1	....	....	....	....	....	....	....	....	39.9
Musicians	19	22	....	....	....	....	2	6	4	4	1	1	1	2	....	....	1	....	....	44.9
Nurses	20	34	....	....	....	1	6	4	4	7	6	2	3	1	....	....	....	....	....	44.1
Physicians	21	42	....	....	2	5	10	10	4	3	4	1	1	1	....	1	....	....	....	35.9
Sailors	22	2	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	39.1
Social workers	23	8	....	....	....	....	....	....	4	2	2	....	....	....	....	....	....	....	....	44.1
Soldiers	24	10	....	....	....	....	2	2	2	2	....	1	1	....	....	....	....	....	....	40.3
Students	25	162	....	....	....	4	4	18	26	27	29	19	14	6	9	5	1	....	....	48.9
Unclassified	26	44	....	....	1	1	6	5	9	7	9	4	1	....	1	....	....	....	....	42.6
Total		1,000	1	2	10	32	78	102	160	164	152	113	71	38	35	19	15	7	1	47.1

large number of specimens obtained, the educational workers range more noticeably toward the upper end of the scale than do the other three groups. The only specimen rated at quality 90 was written by a teacher. Three hundred and ninety-four of the one thousand samples were written by men, and 606, by women. The average quality of handwriting for the first-mentioned group was 43.0, that of the other, 49.7.

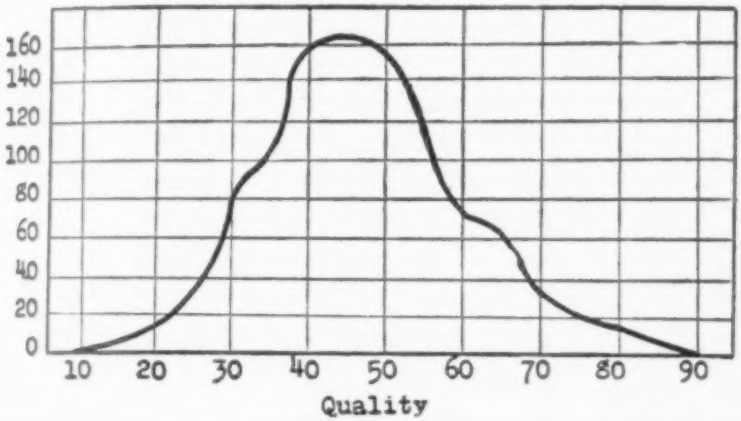

FIGURE 1. DISTRIBUTION OF THE ONE THOUSAND SPECIMENS OF SOCIAL CORRESPONDENCE

The main purpose of distributing and rating the specimens of social correspondence by occupations was not so much to determine the standards of social handwriting for these vocations as to afford a means for studying the effect of these vocations on the social handwriting.

Figure 1 shows that the qualities tend to distribute themselves in close approximation to the curve of normal frequency. Quality 45 with 164 specimens is the mode, with the number of specimens decreasing almost symmetrically from this point to quality 10 on the one side and quality 90 on the other. At first it might seem that the average quality 47.1 should be the standard set for social handwriting; but this would prove to be too low a standard for teaching when we consider that one-half of the

pupils might possibly write below this standard and, therefore, would not meet the social demand. The ideal plan would be to have every child reach the standard set. Undoubtedly this is a reasonable and attainable standard with a graded course of study, an increasing staff of handwriting supervisors, and trained teachers added each year to the corps from the Philadelphia Normal School. A close scrutiny of Figure 1 will show that almost half of the specimens were rated at quality 50 and above, and that 18.6 percent of the writers wrote at quality 60 and above. Furthermore, Figure 2 indicates that in the opinion of the majority of the one hundred judges employed in this study such an average quality is not a reasonable nor an adequate standard of handwriting for use in social correspondence.

Quality of Handwriting Adequate for Social Correspondence

To determine the quality of handwriting adequate for social correspondence the opinions of one hundred competent judges were obtained. The Ayres Scale was cut into its eight parts, and the identifying values 20, 30, 40, etc., were removed. They were then shuffled and handed to the judges to be separated into two groups, those adequate for social correspondence and those inadequate. Each individual's judgments were made independently; in nearly all cases, the source of the specimens was unknown to the judges. The judgments were tabulated and later arranged graphically as illustrated in Figure 2.

The judges had been carefully selected. The clerical assistants in the offices of the Department of Superintendence, school directors, teachers, principals, university deans and professors, and business men and women were represented in the group. The accuracy of the scale and of the decisions of the judges were proved by the fact that not one specimen was misplaced; for example, if the specimen representing quality 50 had been considered adequate, qualities 60, 70, 80, and 90 were also considered adequate, and the qualities below 50, 40, 30, and 20 were all considered inadequate. The dividing line, or minimum adequate

quality, was thus sharply located each time. Again, every judge considered qualities 90 and 80 adequate, and quality 70 with but one exception was also considered adequate. All were unanimous in judging quality 20 inadequate. An inspection of Figure 2 will reveal that only 39 percent of the judges considered quality 50 adequate, while 85 percent considered quality 60 adequate to meet the handwriting demands for social correspondence.

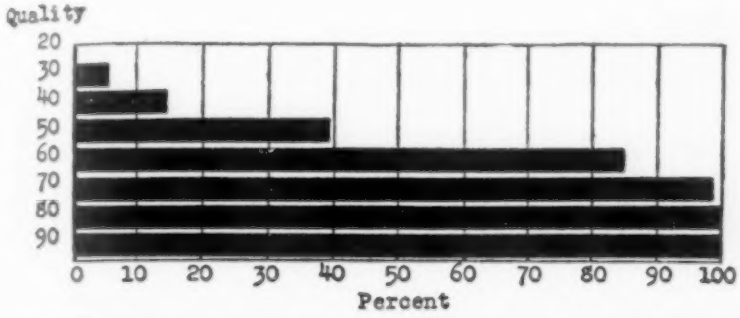

FIGURE 2. PERCENT OF THE ONE HUNDRED JUDGES REGARDING THE DIFFERENT SPECIMENS CUT FROM THE AYRES SCALE AS ADEQUATE FOR SOCIAL CORRESPONDENCE

Reasonable and Adequate Standards of Handwriting

In order to be efficient in education we must have a means of measuring the finished product. Standards of achievement should be both attainable and definite; they should also be accurate, for pupils are to be rated by them. Standards may also be used to determine the effectiveness of teaching. The expenditure of additional time and energy, after a reasonable degree of attainment has been reached, does not always result in a proportionate gain of efficiency. Thus does the law of diminishing returns in practice assert itself. To require the pupils to reach standards of excellence beyond those which are reasonable and adequate is clearly a case of waste in education.

Superintendent Wilson in his report of the schools of Connersville, Indiana, sets the standard of quality for the sixth-grade as 60, while F. N. Freeman says that the average of sixth-grade

quality based upon specimens from fifty-six cities is 59. Many sixth grades in Philadelphia and elsewhere have norms of 60 and above. These facts, in addition to the evidence of the judgments shown in Figure 2, would seem to indicate that quality 60 is not only sufficiently high but reasonable. It was, therefore, recommended that quality 60 on the Ayres Measuring Scale, Gettysburg Edition, be set as the standard for general education to be attained by the pupils in the schools of Philadelphia at the end of grade VI-B. Freeman has said, "We are never justified in placing the standard below what has been actually attained, and has, therefore, been proved to be possible of attainment."[2]

[2] Freeman, F. N. *Teaching of Handwriting.* Boston, Houghton Mifflin Company, 1914. p. 143.

(*To be continued*)

STANDARD DEVIATION VERSUS AGE AS A SCORE UNIT

G. M. WILLSON
New Jersey State Department of Institutions and Agencies

The purpose of this article[1] is to show by certain concrete cases that mental or educational age is often a misleading unit for use in comparing an individual's score on one test with his score on another test, and that a more significant comparison can be made by expressing each score as a deviation from the mean score of the individual's age group. The standard deviation of scores is shown to be a better unit for this purpose than is the percentile.[2]

A comparison of the mental ages of two individuals, and a comparison of their deviations from the mean of their age group as well, may give contradictory results. The Stanford Binet Test,[3] the National Intelligence Test, Scale A, Form I, and the Healy Picture Completion Test, Number II, were given to 78 eleven-year-old public-school boys selected from grades III to VIII inclusive in an eastern city. These boys were selected from each grade in proportion to the incidence of eleven-year-old boys in that grade in the city. The latest available age norms for the National Intelligence Test and the Healy Picture Completion Test were used. The scores obtained are summarized in Table I.

According to Table II, on the Stanford Binet Test *Individual A* attained a raw score of 149, and his mental age was therefore 149 months; his standard score was + .92. A standard

[1] Prepared under the auspices of the Division of Education and Classification.

[2] An excellent presentation of this same point is made in a recent article by Dr. Raymond Franzen to which the reader is referred. He should not, however, be held responsible for the present interpretation. *See* "Statistical Issues, Section I, Commensuration and Age," *Journal of Educational Psychology*, 15:370-73, September, 1924.

[3] The Stanford Binet as here used employs the tests listed by Terman as alternates at the seven-, nine-, and fourteen-year levels in place of a corresponding number of the regular tests at the same levels. No test is changed from one year level to another.

TABLE I. MEAN SCORES AND MENTAL AGES OF SEVENTY-EIGHT ELEVEN-YEAR-OLD BOYS

	Mean Raw Score	Standard Deviation of Scores	Mental-Age Equivalent of Mean Score (Months)
(1)	(2)	(3)	(4)
Stanford Binet ...	129.9	20.8	129.9
N. I. T. (A).....	84.5	31.3	132
Healy (II).....	48.5	18.3	131

TABLE II. SUMMARY OF FOUR INDIVIDUAL SCORES

	Raw Score	Mental Age (Months)	Standard Score	Frequency per 100
(1)	(2)	(3)	(4)	(5)
	Scores of Individual A			
Binet.....	149	149	+ .92	18
Healy (II).....	55	148	+ .36	36
	Scores of Individual B			
Binet.....	145	145	+ .73	23
Healy (II).....	62	178	+ .74	23
	Scores of Individual C			
Binet.....	102	102	−1.34	91
N. I. T. (A).....	48	102	−1.17	88
	Scores of Individual D			
Binet.....	165	165	+1.69	4
N. I. T. (A).....	138	187	+1.70	4

score[4] of + .92 occurs in only 18 out of 100 cases if the distribution of scores is normal. It will be observed that this individual attained nearly the same mental age on both tests, but that 36 out of 100 do as well as he did on the Healy Test, while only half that many in 100 do as well as he on the Binet Test.

[4] This means that his score was .92 of the sigma of the group above the mean of the group.

$$\text{Standard Score} = \frac{X - M_x}{\sigma_x}$$

Individual B presents the opposite situation; his standard scores are nearly equal in size and frequency, yet his mental age is 33 months higher on the Healy Test than on the Binet.

Similar situations in Binet and National Intelligence Test scores are shown for two other individuals. The discrepancy is

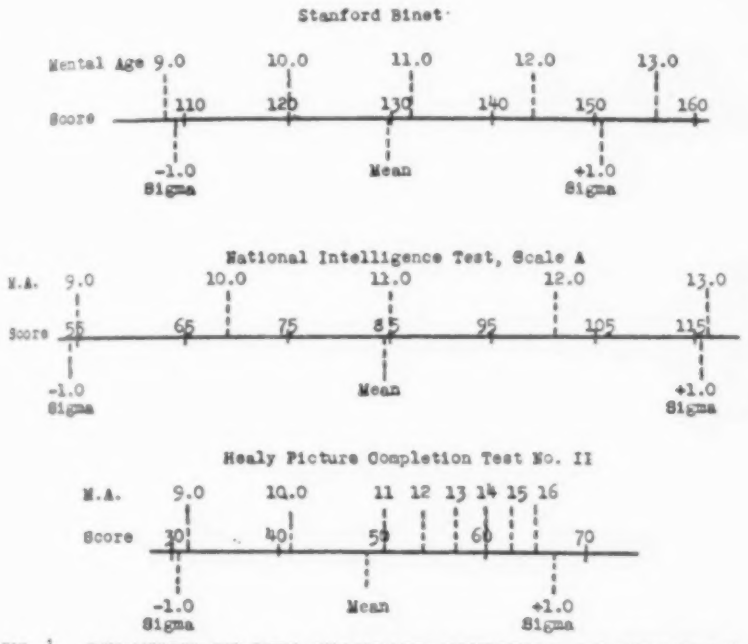

FIG. 1. RELATION OF THE STANDARD DEVIATION OF SCORES OF SEVENTY-EIGHT ELEVEN-YEAR-OLD BOYS TO THE AGE NORMS ON CERTAIN TESTS

evident in both cases though less marked in the case of *Individual C* whose scores are below the mean.

The extent of the disagreement between mental ages and standard scores for these examinees and these tests may be seen in Figure 1. In this chart the scale for each test is a scale of raw scores. Age norms are indicated above the scale. Below this scale are indicated the mean and certain standard-deviation points for the 78 examinees.

From this chart certain relationships are apparent. The mean is slightly below the eleven-year-old norm in each case. The —1.0 sigma points are almost exactly two year-steps below the means in the case of Healy and National Intelligence Test, but only 1.7 years below the mean in the Binet Test. The + 1.0 sigma point is more than five year-steps above the mean on Healy Test, two year-steps above the mean on National Intelligence Test, and 1.7 year-steps above the mean on the Binet.

Why These Contradictions Occur

In an article previously mentioned, Dr. Franzen has pointed out that the fundamental reason why this irregular relationship between test age and standard scores exists is the fact that tests correlate differently with chronological age. If a group of children, eight to fourteen years of age, were tested with a certain test, and the standard deviations of scores for each age group were found to be nearly as great as the standard deviation of scores for the total group, then the correlation of the test with chronological age would be low, and the range from + 1.0 sigma to — 1.0 sigma for any age group would extend over a large number of steps on the age scale. Such a test is represented by Figure 2, where the length of the horizontal lines represents the range from + 1.0 sigma to — 1.0 sigma for each age group. The means for the age groups are projected on the base line and represent age norms. Figure 3 represents a test having a higher correlation with chronological age. On such a test, the range from + 1.0 sigma to —1.0 sigma for any age group extends over relatively few steps on the age scale. Plus 1.0 sigma for ten-year-olds on Test A means a test age of more than fourteen years, while on Test B it means a test age of only 11.3 years.

For the group of eleven-year-old boys here used, the range of chronological age is so small that reliably different correlations with age are not obtainable, but it is evident from Figure 1 that the Healy Test would show a greater overlapping of age groups in the higher age levels than would either of the other two tests; hence it would approach the form of Figure 2 at these levels.

The wide scattering of scores at each age level, shown in Figure 2, may also be caused by the presence of many and large chance errors in the test scores, namely, by unreliability of the test. This factor is always operative to a greater or less extent to produce low correlations of a test with age or with any other criterion. The real correlation with age must be determined by correcting the obtained correlation for this attenuation due to chance errors.

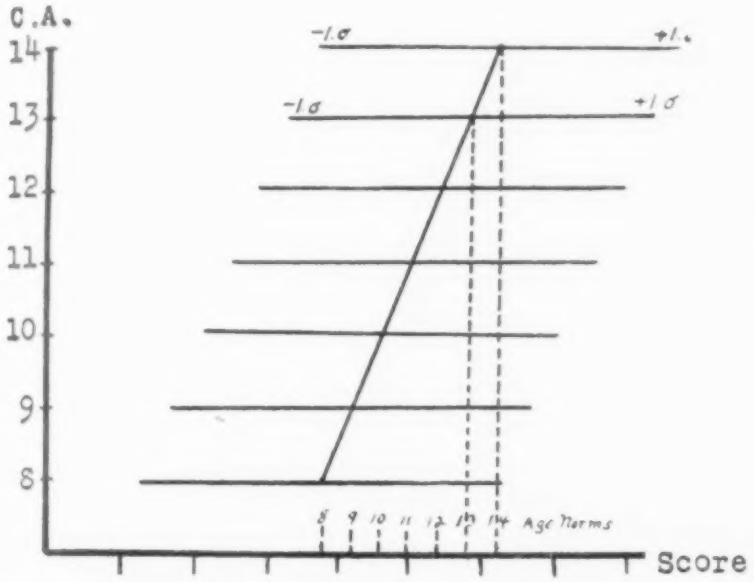

FIG. 2. OVERLAPPING OF SCORES IN SUCCESSIVE AGE GROUPS IN A TEST HAVING LOW CORRELATION WITH CHRONOLOGICAL AGE

As stated previously, the overlapping of scores of these seventy-eight eleven-year-old boys over the norms for other ages in the three tests here reported is greatest for the Healy Test and least for the Stanford Binet. Data at hand indicate that this order is identical with the order of the three tests for reliability in this group, Stanford Binet being most reliable.

Standard Score as a Unit

When standard scores and test ages stand side by side, it is the standard scores which are the more significant of what we usually really want to know. The real measure of excellence of a boy's score is: How many boys in 100 of this boy's age can do as well as he did?[5] It is the rareness of a jewel that makes it precious.

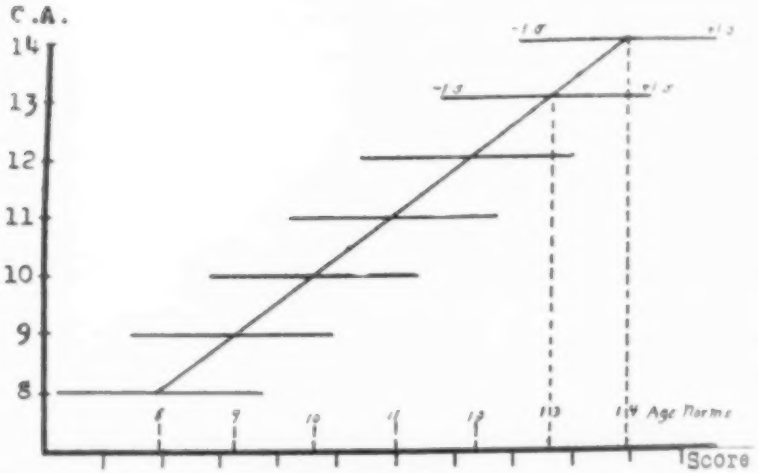

FIG. 3. SIMILAR TO FIGURE 2 BUT FOR A TEST HAVING A HIGHER CORRELATION WITH CHRONOLOGICAL AGE

An eight-year-old boy who scores one sigma above the average of his group on the test represented in Figure 3 thereby gets a test age of 9.4 years. If he scores one sigma above his group average on the test of Figure 2 he gets a test age of fourteen years. In either case, only 17 percent of the boys of his age do better than he. It is an accident of the tests, not a quality of the boy, which gives him in one case a test age of 9.4 years and in the other a test age of 14 years.

[5] "How many" is not an entirely adequate phrase with which to describe the standard score as will be shown later.

Similarly for *Individual A* of Table II, only 18 boys in 100 do as well as he did on the Binet Test while 36 boys in 100 equal his Healy score. He did much better on the Binet than on Healy even though the latter's age groups overlap so widely that he received practically the same mental age rating on the two tests.

Standard scores may be read from a table just as mental ages and percentiles are commonly read. By their use a child is always being measured against an unselected group of children of his own age. His relation to this group on one test can be compared directly with his relation to the same type of group on another test. Accomplishment equal to intelligence is shown by approximately identical standard scores on intelligence and on educational tests. Normal growth consists in maintaining the same standard scores from year to year.[6]

In another publication[7] Dr. Franzen shows how this standard score may be expressed as a "sigma index" by setting a standard score of zero as equal to 100, a standard score of plus one equal to 120, minus one equal to 80, and so on. The scores are then all positive numbers, and they are directly interpretable as percents of normal or mean ability for the child's age.

The use of percentiles of raw scores as a basis of comparison of tests has the merit of comparing each child with other children of his own age, but there are serious objections.

The percentile, while it takes account of the number of cases, counting from the median or fiftieth percentile, does not take proper account of their relative distances from this median. We are failing to use certain aspects of our data when we merely count how many scores are between a certain child's score and

[6] It may be objected that a child's standard score would be likely to fluctuate somewhat if the child were frequently retested due to the fact that he increases in ability at a fairly constant rate from month to month while the reference point (mean of his age group) changes by a relatively large amount at a less frequent interval (once a year). It would be possible to obviate this fluctuation by simple interpolation of raw scores corresponding to fractional parts of a year between the means of two successive age groups and between corresponding standard-deviation points for the two age groups.

[7] Franzen, R. H., and Hanlon, W. H. *The Program of Measurement in Contra Costa County.* Published by the authors and printed by Standard Print, Martinez, California.

the median score for his age and leave out of account the size of the intervals between these scores. The standard score includes both. It takes as its reference point the mean which depends upon distances as well as number in every part of the distribution rather than the median which ignores distances. Its unit (sigma) is a function of both number and distance.

Allied to the above is the fact that the differences represented by a given percentile step are not the same at different parts of the distribution. For example, if a 45-percentile score is one unit of difficulty easier than a 50-percentile score, then a 10-percentile score is much more than one unit of difficulty easier than a 15-percentile score—approximately two units easier in fact, assuming a normal distribution. Furthermore, the standard deviation, unlike the percentile, is an easily commensurable statistical quantity. It is not more difficult to handle than the percentile, and it tells much more to the individual who is able to interpret it.

OVERLAPPING IN HIGH SCHOOL AND COLLEGE AGAIN

THELMA HUNT
George Washington University

This study was suggested by the article, "Overlapping in High School and College," by Leonard V. Koos.[1] By an examination of the contents of chemistry courses in twenty-six high schools and forty-one higher institutions, he found considerable overlapping. He says: "If the materials presented in high-school courses may be presumed to be secondary in character, there is relatively little in these first college courses which is not also secondary." He has found that a similar condition, though less pronounced, exists in economics courses. His examination of college catalogues for practices of colleges in regard to high-school work led him to the conclusion that "there is an all too common disregard in the college of what the student has compassed in his period of high-school training."

The data for the present study were collected from the George Washington University and from the high schools of Washington. Four different sources of material were used: the courses of study in the college and high school as listed in the college catalogue and high-school bulletins; textbooks used in college and high school; college mid-term records; and the achievements of college and high-school students on tests.

COMPARISON OF COURSES

In the first comparison the actual courses listed in the syllabi for the freshman college year and the high school are contraposed. The 1924-25 catalogue of George Washington University offers courses totaling 344 credit hours which are open to Freshmen. These include all the freshman courses in the Department of Arts and Sciences, as well as those in the Engineering College. The overlapping courses will be differentiated as follows: Group I, those courses given in the high school, which,

[1] *Journal of Educational Research*, 11:322-36, May, 1925.

if successfully completed, take the place of the elementary courses in college, such as, first-year French or German; Group II, those courses offered in the high school, which are to some extent covered a second time in collegiate courses, such as freshman chemistry.

Of the 344 credit hours offered, 65 belong to the group, which, although taken in the high school, are counted as satisfactory equivalents to the corresponding collegiate courses, that is, they belong under the first of the two classes. One hundred and four of the credit hours yield partial collegiate credit, for they are repetitions of courses taken in the high school—that is, they belong under the second class. In other words, 18.9 percent of the courses open to Freshmen are covered entirely by high-school courses, and 49.1 percent are covered either wholly or in part by high-school courses. The real overlapping in work done is even greater than is indicated by these figures, for the courses which belong exclusively to college are in almost every case those which are actually taken by a small percent of college students. A more detailed analysis of the courses offered both in the high school and in college is given in Table I.

Comparison of Textbooks

Comparison of the textbooks is the second method of determining the amount of overlapping. High-school courses which are credited in college to the extent of satisfying elementary college-course requirements were not considered in this examination, for obviously the texts for such courses must be sufficiently alike to contain practically identical material. For the courses in which there is a great deal of repetition, college texts were compared with the high-school texts to ascertain what proportion of the college text is included also in that of the high school. Except in the case of English literature, the results of comparison must necessarily contain a certain element of the personal judgment. This has been reduced to a minimum, however, by familiarity with the material, careful checking of rather detailed divisions of the subject-matter, and consideration of both

TABLE I. ANALYSIS OF COURSES GIVEN BOTH IN HIGH SCHOOL AND COLLEGE

Subject	Course	College Credit	Length of Course in Years	
			High School	College
(1)	(2)	(3)	(4)	(5)
	Group I			
French	First-year French	6	2	1
	Second-year French	6	2	1
Spanish	First-year Spanish	6	2	1
German	First-year German	6	2	1
Mathematics	Algebra, solid geometry, trigonometry	6	1.5	1
	Algebra, trigonometry	6	1.5	1
	College algebra	3	.5	.5
Home economics	Domestic science	6	2	1
	Textiles	4	2	1
Latin	Cicero and Virgil	6	2	1
Greek	Elementary	6	(seldom given)	1
	Second-year	4		1
	Group II			
English literature	Survey	6	1.5	1
Chemistry	General	6	1	1
	Laboratory	4	1	1
Physics	General	6	1	1
	Laboratory	4	1	1
History	Mediaeval	6	1	1
	Modern	6	1	1
	Ancient	6	1	1
	American	6	1	1
Botany	Elementary	6	1	1
Mathematics	Trigonometry and analytical geometry	6	(not all covered)	1
Mechanical drawing	Elementary	4	..	1
Freehand drawing	Elementary	4	..	1
Economics	Elementary	6	.5	1
Political science (Civics)	Elementary	6	.5	1
Conversational French		6	..	1
Conversational Spanish		6	..	1
English composition		6	..	1
Chemistry	Analysis and methods	4	..	1

the number of pages and the content in making the judgment. In every case except English literature the method has been to divide the whole subject into topics or subdivisions and make a relative comparison of these subdivisions. That is, the amount covered in the college text was taken as a unit or was called 1. Then, considering both the number of pages and the content, the proportion of this amount included in the high-school text has been determined and called one-half, one-fourth, etc., according to the relative proportion. Comparisons in English literature, chemistry, physics, and economics are summarized in this paper.

English literature.—Using the high-school textbook, *Twelve Centuries of English Poetry and Prose,* and the college textbook, *Century Readings in English Literature,* all the selections in both courses were counted except those of contemporary writers and war poets appearing in the college text. These were not considered, since they did not appear in the high-school text, although in the high school the corresponding authors were studied from other books. The relative proportion of repetition would not have been changed enough to make it worth while to collect the high-school sources of these modern authors and to include them.

By count, 532 selections are read during the college course; of these same selections 179 are studied in the high-school course. The repetition in identical selections, then, is 34 percent. One hundred and thirty-five authors are studied in the college course, and 84 of them are studied in the high school. The percent of repetition in authors studied through representative works is, therefore, 62. If we consider the study of representative literature for the various periods and types of literature in English writing, the repetition is practically 100 percent.

Physics.—The textbooks compared were *Practical Physics* by Black and Davis, and *College Physics* by Kimball. The relative amounts of similar material in the two texts on the basis of college units were found to be 8.75 in the high school and 22 in college. Here there is a repetition of 40 percent.

The laboratory manuals indicate an even greater repetition. Of thirty-five experiments performed in college, the following

seventeen are covered in principle in the high-school laboratory: weighing and measuring, convex lenses, concave mirrors, index of refraction of light, resonance, Ohm's law, electrical resistance, induction and electro-magnets, magnetic lines of force, Wheatstone bridge, heat of fusion, linear heat expansion, forces in equilibrium, specific gravity, density, machines, and moment of forces. The repetition here is 48.5 percent. In some of these experiments the procedure in the college laboratory, in all likelihood, is more accurate and more technical.

Chemistry.—The chemistry texts compared were McPherson's *An Elementary Study of Chemistry* and *A Course in General Chemistry*. The relative amounts covered are 20.25 in the high school and 42 in college. Thus the repetition in chemistry textbooks is 48 percent.

The laboratory course in freshman college chemistry consists of experiments covering thirty-three principles designated according to titles in the laboratory manual. Of this number, eighteen are included also in the high-school manual. This gives 54.5 percent, a surprising amount of repetition. Manuals in both high school and college are designed by the teachers in charge.

Economics.—A study of economics from Carver's *Elementary Economics* and Ely's *Outlines of Economics* indicates the relative amounts of material covered to be 1.25 in high school and 6 in college, a repetition of 20.8 percent.

Comparison of Grades in Science Classes

Approach to the problem from the point of view of the textbook or the course of study does not allow for inability to master portions of the text or to pursue parts of the curriculum, nor does it allow for teaching methods which do not closely follow prescribed courses or texts. An approach is possible which makes allowance for this, because students' records and achievements furnish the best measure of actual overlapping which exists.

The first method used was to compare the college grades of two groups of students—those with preliminary high-school

work and those with no preliminary high-school work—in certain college courses. Two courses are reported in this study—first-year college chemistry, a lecture course, and the first-year college physics, not in the College of Engineering. Average college students were obtained in both these courses, for the courses were required for certain groups of students and were open as elective to all students. In the chemistry course the proportion of Freshmen was greatest, in the physics the proportion of Sophomores was greatest. The procedure was as follows: the grades at the end of one semester of college work were obtained together with information as to whether the student had had a course in chemistry or physics in a secondary school. Since one professor had all the chemistry students and another professor all the physics students, no adjustment had to be made for differences in standards of grading within the same subject. The grades obtained were given in letters, A, 96-100; B, 90-95; C, 80-89; D, 70-79; E, condition; F, failure. Grades E and F have been grouped together as unsatisfactory attainment. From Table II and Figure 1 the percent of students attaining each rating may be compared, that is the records of the high-school prepared students may be contrasted with those of the non-prepared in the two classes.

If there were no overlapping and if the high-school courses were of any value, the students with no preliminary high-school work should fall distinctly below the students with high-school preparation. They do fall somewhat below the high-school prepared students, giving slight advantage to the student with preliminary science, but the difference in distribution of grades is small enough to indicate a large amount of overlapping. It must be true that whatever knowledge the high-school prepared students have obtained in high school is also obtained to a large extent by the other group in the college course.

Comparison of Test Achievements in Chemistry

Comparison of actual achievements of high-school students and of college students was made by test scores on a locally

devised test given to a college class in elementary chemistry and to two high-school classes in elementary chemistry. None of these classes was a selected class. The test was given at the end of the first semester's work. The median score of all college students was 32, that of all high-school students, 28, while the median of the college students who had taken chemistry in high school was 36, and that of those who had had no chemistry in

TABLE II. COMPARISON OF SEMESTER GRADES IN FIRST-YEAR COLLEGE CHEMISTRY AND PHYSICS

Grade	With One-Year High-School Course		With No Preliminary Course	
	Number	Percent	Number	Percent
(1)	(2)	(3)	(4)	(5)
	Chemistry			
A	1	0.9	.....	.....
B	35	32.4	14	23.0
C	64	59.3	35	57.4
D	8	7.4	11	18.0
E and F	.....	.....	1	1.6
Total	108	100.0	61	100.0
	Physics			
A	1	2.2	1	2.5
B	7	15.6	2	5.0
C	11	24.5	11	27.5
D	15	33.3	12	30.0
E and F	11	24.4	14	35.0
Total	45	100.0	40	100.0

high school was 30. The correlation (Pearson coefficient) between the percent correct for the high-school group and for the college group on each item is 0.88. This high correlation coefficient indicates that the questions which were hardest for the high-school students were also the ones hardest for the college students.

Value of High-School and College Work

With the other type of overlapping course—the one which is not repeated in college—such as elementary French, there comes

a little different problem in college administration. In deciding whether to allow college credit for high-school work, the question of the relative value of high-school and college work must be met. Two subjects have been used in attempting to show the relative value of high-school work and college work in certain elementary branches of rather mechanical studies.

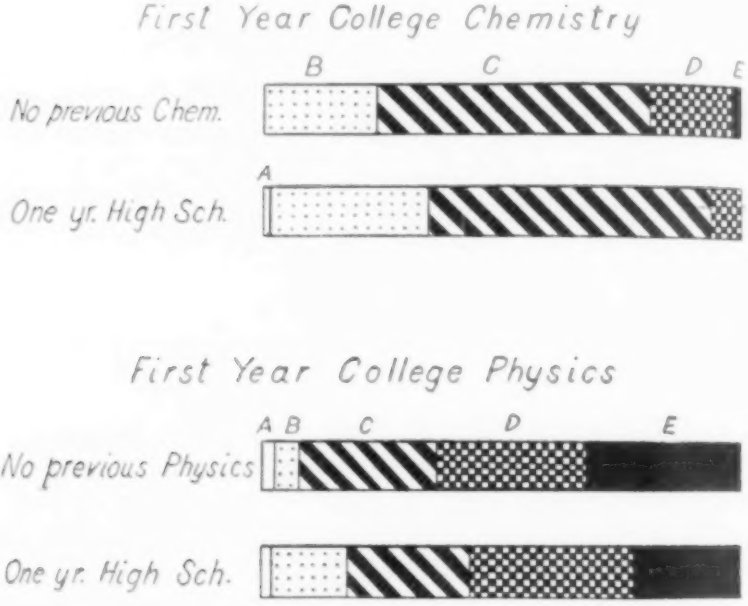

FIGURE 1. COMPARISON OF SEMESTER GRADES

A comparison has been made of mid-term grades in second-year college French and in second-year college mathematics between students who had the first year of French or mathematics in high school and those who had the first year in college. Table III and Figure 2 show the percent attaining various grades for the two groups. In the case of the marks in French and mathematics a method had to be found for reducing the grades to a comparable standard, since they were given by teachers with different standards of marking. A statistical measure, the standard deviation, was here used. From calculated tables of stand-

ard-deviation values for each professor's grades, each student is assigned a value for his grade in terms of its deviation from the average of the class, the grades above average being represented by plus standard deviation (or sigma) values, and the grades below average, by minus values. Table III and Figure 2 give the distribution of these grades.

TABLE III. COMPARISON OF SEMESTER GRADES IN SECOND-YEAR COLLEGE FRENCH AND MATHEMATICS

Grades Sigma Values	First-Year in College		First-Year in High School	
	Number	Percent	Number	Percent
(1)	(2)	(3)	(4)	(5)
	French			
1.2 to 2.0	4	10.4	5	8.5
.4 to 1.2	8	20.5	21	35.6
− .4 to .4	17	43.5	18	30.5
−1.2 to − .4	8	20.5	14	23.7
−2.0 to −1.2	2	5.1	1	1.7
Total	39	100.0	59	100.0
	Mathematics			
1.2 to 2.0	3	15.8	2	4.6
.4 to 1.2	7	36.8	18	40.9
− .4 to .4	1	5.3	6	13.6
−1.2 to − .4	8	42.1	16	36.4
−2.0 to −1.2	.....	.....	2	4.5
Total	19	100.0	44	100.0

Administrative Relationships

An examination of the methods of teaching yields little on which to base any conclusions as to differences between the value of high-school teaching and that of college teaching. In the science courses the proportion of laboratory and lecture or recitation work is practically the same. In language work there is little difference in the method of attack, although there seems to be more conversational work in the high-school elementary courses. In most of the classes examined the frequency of written tests or examinations is greater in the high school.

Much of the trouble in the relation of high school to college is due to the fact that the two are planned on the same educational cycle. The high school offers an education in essentially factual studies. This factual basis for education is not completed in the high-school cycle; consequently it is continued in the college cycle with the present costly repetition. Required subjects in high school are also the required subjects in college. Com-

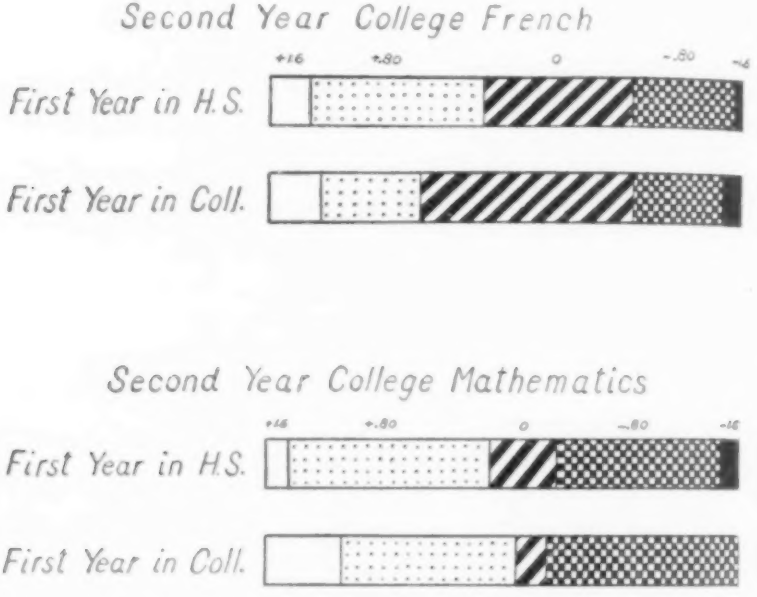

FIGURE 2. COMPARISON OF SEMESTER GRADES

paring the general arts-and-science curriculum with the high-school curriculum we find that there is no required group in high school which is not required in college, and vice versa there is none required in college which is not also required in high school. A comparison of the required course in college and high school is given in Table IV.

TABLE IV. CREDIT REQUIREMENTS OF HIGH SCHOOL AND COLLEGE

Subject	High School		College	
	Number of Credits	Percent of Total Credits Required	Number of Credits	Percent of Total Credits Required
(1)	(2)	(3)	(4)	(5)
English	8	25.0	12	10.0
Foreign language	4	12.5	12	10.0
History or social science	2	6.25	12	10.0
Mathematics	2	6.25	6	5.0
Science	2	6.25	Math. or Science	....
Elective	14	43.75	78	65.0
Total credits to graduate	32	100.0	120	100.0

Conclusions

A considerable proportion of the courses offered to college Freshmen is also given in whole or in part in the high school.

An examination of college and high-school textbooks in certain subjects shows a large overlapping in content.

College grades in first-year college science courses indicate that students in these courses who have had preliminary work in the science in the high school do slightly better than those who have not studied the science before.

Grades in certain second-year college courses indicate that students who have had the first year of the work in college do no better than students who have had the first year in the high school.

An examination of curricula and graduation requirements indicates that the high-school and the college courses are planned largely on the same educational cycle.

ACTIVITY ANALYSIS IN CURRICULUM-MAKING

ROY IVAN JOHNSON
Division of Research, St. Louis Public Schools

Activity analysis is a term which has been widely employed to designate the process of analyzing activities of all degrees of generality. It seems, however, that a distinction should be made between the analysis of a general field of activity into constituent activities and the analysis of a particular activity to discover not only the various elements of activity but also certain methods and standards of successful performance. The difference between the two occasions for analysis may be made clearer by an illustration. If the whole field of civic conduct is analyzed to determine the numerous civic activities which constitute the field, or if the whole range of human experience is analyzed to discover the major fields of activity, we have an example of activity analysis in its more general form. On the other hand, if a particularized activity, such as operating a machine drill or making a speech, be subjected to this process, we have an example of activity analysis in its more particularized form. The former is an analysis of activity (general); the latter is an analysis of *an* activity (particular). The former particularizes by discovering constituent activities only; the latter particularizes not only by pointing out lesser units of a certain performance but also by defining standards of successful performance and by discovering methods, attitudes, knowledge, and skills required for successful performance. The former may be called "conduct analysis"; the latter is often designated by the term "job analysis." In the vocations, job analysis is the accepted term for the analysis of particular activities, jobs, or positions connected with the labors of any vocation.

In this discussion the term conduct analysis will be used to indicate the general analysis of human experience and activity analysis will be reserved for the more specific analysis of particularized performances. The term job analysis has such a flavor of the vocations that its seems desirable to restrict its

denotation to vocational situations, though it should be remembered that the actual processes of job analysis may have the same purposes and methods as the activity analysis of tasks in regular academic curricula.

Uses of Conduct Analysis

One of the chief uses of conduct analysis is to clarify one's understanding of general educational objectives. Such nebulous and elusive aims as adjustment and efficiency simply add to the verbiage of educational philosophy. These terms must be endowed with a real entity of meaning by definition and particularization correlative with the definition and particularization of the fields of human experience for which adjustment and efficiency are demanded. For example, civic efficiency, parental efficiency, language efficiency, and physical efficiency become more significant when one recalls specific phases of experience where efficiency is to be manifested. The meaning is further clarified if any one of the fields, civic, parental, linguistic, or physical, is, by means of conduct analysis, broken up into specific constituent activities which call for efficient performance. When analysis reaches this point, the curriculum-maker no longer labors with abstractions of doubtful meaning. He is face to face with hundreds of concrete objectives in the nature of abilities to perform the various activities characteristic of normal experience. For the first time he, and everyone connected with the school organization, can know definitely the goals of education. Such delineation of objectives is indispensable in the work of curriculum-making, since the pupil activities and experiences which are to constitute the curriculum must be selected with continual reference to the specific ends to be attained.

Moreover, conduct analysis establishes a rational basis of selection for departmental objectives. Since the legitimate objectives of general training will be included in the range of desirable human abilities revealed by conduct analysis, the legitimate objectives of each department of the curriculum of general training will also be included within the range of such abilities.

Hence, the distribution of the various objectives among the several departments best suited to their respective development is an antecedent step to the determination of subject-content. This practical use of conduct analysis is, of course, conditioned upon the retention of the traditional subject-fields. If the traditional departments were abandoned and new organizations established, the list of activities derived through conduct analysis would serve as the basis of departmental organization rather than the basis of departmental selection.

Uses of Activity Analysis

Activity analysis, which may be looked upon as a continuation, or refinement, of conduct analysis, has various practical uses. It further particularizes the objectives established by a general analysis of experience. For example, if the ability to be developed is the ability to operate a machine drill, to make a contractor's estimate, to deliver a public address, or to cast one's vote, the essential parts of the activity, together with the corresponding specific abilities demanded, may be discovered by analysis.

Activity analysis may also reveal successful methods of performance. In the development of an ability, the final efficiency attained may be determined, in part at least, by the nature of the methods employed. Sometimes one hits upon inefficient methods by chance; sometimes they are adopted through unwise choice. It seems obvious, therefore, that the curriculum must contain much material relative to method if it is to achieve its purpose. That is, the curriculum-maker will keep in mind not only desirable activities to be performed but also desirable ways of performing these activities. Activity analysis assists in discovering the desirable ways. Sometimes important items of method may be discovered by analyzing the weaknesses of inefficient performance.

If extensively applied, activity analysis will furnish standards of performance. Standards are a necessary third element of curricular content. They may be called ideals, or qualities, or

standards, but whatever the terminology, they serve as measures of satisfaction in the performance of specific activities. Naturally some kind of standard will be applied whether it has been scientifically determined or not. Accuracy, for example, is a characteristic whose importance is continually observed in connection with certain activities. Hence, it is applied as a standard against which to check the satisfactory performance of those activities. Since daily observation is, in one sense, a continuous process of analysis and generalization, we may, at least tentatively, admit accuracy as a valid standard; but the danger is that in setting up a number of such standards some will be dictated by arbitrary opinion or too-quick generalization rather than by careful scientific procedure.

Activity analysis may be used to determine, as a fourth use, the qualities of character or disposition required in performing the duties of certain positions. Data thus secured may be applied to the selection of personnel. It is probable that job analysis has been more widely used for this purpose than for any other. The vocations have long recognized its value as a device for fitting the man to the job.

Stated briefly, the major purpose of activity analysis in its relation to curriculum-making is the discovery of content. It bridges the gap between aim and subject-matter. Too often this bridge is merely the arbitrary judgment of a textbook-maker or a blind faith in the traditional content. Charters, in his book on *Curriculum Construction*, emphasizes the point that educators in the past have not shown a clear connection between aims and subject-matter. He says:

> While writers on the curriculum have begun with the statement of aim, none has been able to derive a curriculum logically from his statement of aim. In every case he has made an arbitrary leap from the *aim* to the *subject-matter* without presenting steps which irresistibly lead us from aim to selection of material.[1]

[1] Charters, W. W. *Curriculum Construction.* New York, Macmillan Company, 1923. p. 6.

Analyzing Performances and Products

In analyzing an activity, the attention may be directed toward the actual steps of performance, the action process, or it may be directed toward the finished product of the performance. In making a speech, for instance, mounting a rostrum, assuming the physical attitude of a speaker, and gesticulating are important so far as outward signs are concerned; but the analysis of the activity of speech-making will be superficial unless adequate attention is given to the *speech itself*. Hence, the method of analysis may be applied not only to the physical aspects of a performance but to the correlative *products* of the performance as well. The analysis may take either direction or both directions according to the nature of the activity and the immediate purposes to be served. In discovering *standards* of satisfactory performance the analysis of activity *products* is very important. Also, many activities are so largely subjective that their resulting products afford practically the only basis for objective analysis.

Difficulty Analysis

Often activity analysis takes the form of difficulty analysis. This is especially important as a means of determining instructional material needed in the school and the relative emphasis which should be given to various units of such material. Other analyses, designed to discover standards and methods of proper performance, must precede difficulty analyses—unless such standards are unquestioningly accepted on the ground of common consensus—for shortcomings can be detected only in the light of accepted criteria of excellence.

In subjects like spelling and grammar[2] where the standards are comparatively well defined, difficulty analyses are easily made, and their results are especially valuable; but a difficulty analysis of citizenship activities would necessarily be handicapped by uncertain standards and would issue in correspondingly uncertain findings.

[2] A number of studies in spelling and grammar have been made to discover errors made by students and to use the findings as a basis for modifying instruction. The best known of such studies is probably that of Charters on the language errors of Kansas City school children.

The factor of change makes frequent difficulty analyses desirable. Even though the activity in question may remain fairly constant, the school continually faces new teaching problems because of the *fluctuation in difficulty*. The types of difficulties which call for attack will vary with individuals, groups, and localities. For this reason, the repetition of that phase of analysis which discovers difficulties is extremely valuable as an instructional aid.

Refinement of Analyses

Because an activity may be modified by attendant circumstances and conditioning factors, probably no single analysis will be exhaustive enough to cover every occasion of performance. A complete analysis would take into consideration all possible modifications of the activity, but for practical purposes it may be assumed that the normal conditions of performance are sufficiently similar to warrant conclusions on the basis of a single general analysis. If, however, more exhaustive data are required for effective instruction in the performance of the activity, the results of the original analysis may be refined by making supplementary analyses of subtypes of the activity.

For example, social letter-writing and business letter-writing are types of a general activity. Analyses of these two types could be refined by selecting such subtypes as letters of congratulation and letters of collection for special study. These, in turn, offer possibilities of further classification on the basis of occasion or conditioning circumstance. The extent to which such refinement should be carried will depend upon the demands of general training. It is not desirable to carry analysis into the field of specialized performance to secure material for the curriculum of general training. It is unwise to obscure standards of general accomplishment by analysis of comparatively rare occasions of an activity.

Methods

Charters mentions introspection, working on the job, questionnaire, and interviewing[3] as four methods which may be used

[3] Charters, *op. cit.*, p. 38.

in analyzing an activity. The first two are methods of obtaining information from one's own experience; the last two are methods of getting information from other people's experience. To this list should be added a fifth method; namely, careful observation or inspection.

In view of the important rôle which observation plays in collecting information about life, it cannot be omitted from the list of methods applicable to a process whose purpose is the discovery of essential facts related to life activities. Especially does the method of observation or inspection become valuable in connection with the study of activity products. It has already been pointed out that the process of analysis may be directed toward the product of performance or toward the performance itself. In our thinking there is an almost inseparable relationship between the two things. When reference is made to a man's work, it may mean his production or it may mean his expenditure of effort. When the material products of effort are analyzed, it is obvious that the major method employed will be intensive observational study. On the performance side, also, a large fund of practical information is to be gained through mere observation —simply by seeing things done, watching others as they perform the activities in question.

Some Contributions That Have Been Made

Tentative analyses of conduct have been offered as bases for further particularization. In 1860 Herbert Spencer presented five categories for the classification of human experience. Bonser's[4] analysis of conduct evidently takes its color from Spencer's. Bobbitt's classification[5] includes ten categories which seem to cover, with satisfactory completeness, the range of human activities.

The particularized list of objectives presented in Bobbitt's work represents probably the most comprehensive analysis of

[4] Bonser, F. G. *The Elementary School Curriculum.* New York, Macmillan Company, 1924. 466 pp.

[5] Bobbitt, Franklin. *Curriculum-Making in Los Angeles.* Chicago, University of Chicago, 1922. pp. 7-32. (Supplementary Educational Monographs, No. 20)

conduct which has been attempted. The list is scientific in the sense that it is based on wide observation and has been subjected to the critical emendation of a large number of persons. Charters' diagnostic grammar study in Kansas City, his industrial analyses in Pittsburgh, his analysis of women's activities relative to the Stephens College curriculum, and his analysis of secretarial duties and traits are typical examples of the use of activity analysis in curriculum-making.

In addition to these major contributions, a number of less extended analyses have been made. In 1923, Charters reported 56 studies distributed among the various subject-fields.[6] Other studies have since been completed or are now in progress.

Where the Process of Analysis Should Begin

Much work that has been done in the curriculum field has been ineffective because the unit which has been arbitrarily selected and analyzed has not always been logically derived from larger units by antecedent analyses. Non-functional material will never be eliminated by such a procedure. The curriculum-maker must begin with experience as extensive as life and end with experience as definite and particular as any which the individual pupil requires for development and growth. Logical and effective curriculum reconstruction will come only as a result of successive and systematic analytic attacks upon the units of experience in a descending order of extensity. Naturally, such a program requires a long period for its maturity, but eventually it will produce a new curriculum in each subject-field, and the functional value of every unit of content in the curriculum thus evolved will be clearly demonstrable.

[6] Charters, *op. cit.*, Part II.

Editorials

ON THE NEED OF EXPERTNESS IN PSYCHOLOGICAL WORK

No one who has been carefully trained in psychology can fail to be struck with the fact that his is the one branch of science in which nearly everyone claims to possess more or less expertness. Five minutes of discussion concerning the merits of evidence for the apparently marvelous in the domain of psychical research, for example, is sure to bring forth categorical statements of belief from half a dozen participants, every one of whom is certain that his personal convictions are every whit as reliable and valid as the assertions of the best psychologist the world ever knew.

Similarly, one can note in many quarters, even among those who seem reasonably well-trained teachers, the notion that anyone can undertake to teach psychology at short notice. Several years ago we received a letter from a perfect stranger, in which he announced that he had just been appointed to teach the courses in psychology in the X Normal School. He went on naïvely to say:

> As I have only ten days to get ready for this work and have never taught any psychology before, I would like a little help in getting my material organized. Will you, therefore, be kind enough to send by return mail complete outlines of three courses in psychology suitable for normal-school students, with recommendations as to textbooks and references?

We fear our reply was not particularly courteous, as we advised this aspirant to the profession to resign his appointment and take three years to prepare for his job.

All this is perhaps more amusing than serious, but there are

other aspects of psychological work in which such rank amateurism does take on a more serious aspect. We refer particularly to the tendency in some quarters to appoint to psychological positions in the public schools persons whose qualifications are quite as lamentably lacking as those of our normal-school inquirer. The reason why such appointments are serious is, of course, that such appointees are dealing with material that definitely affects the welfare of hundreds of school children. A poor piece of teaching in normal-school or college psychology is unfortunate, but it is certainly less likely to bring our profession into disrepute, and far less likely to affect adversely the careers of other human beings, than is a poor piece of investigative work in the schools.

The reader will perhaps question the existence of the tendency just mentioned. But the inquiry of the normal-school teacher to which we have alluded can be paralleled by a similar inquiry recently received by one of our professional colleagues, which was, in substance:

> I have been appointed head of the Bureau of Psychological Investigation in the Y public schools. As I am somewhat inexperienced in this work, and as I naturally wish whatever I attempt to be successful, I am appealing for guidance to those who are well experienced in the field and have made important contributions to it. Will you, therefore, kindly advise me as to what tests I should include in my program for the year. What grades would best be included in this program? Is it advisable to use more than one test in conducting a survey? What in your judgment would be the best way for me to make use of the results I obtain?

Another instance: at the summer school of a well-known state university, a student asked permission to visit for an hour in a course devoted to instruction in the use of the Binet Scale. On being asked what he expected to get from a single visit, he replied: "I had thought of taking the course, but other work, which it was more important for me to take, conflicted with the schedule of your course. But since I have been appointed to teach a course in Binet testing this fall at X College, and have never had any experience with the tests, I thought it might be well for me to visit your course for a period or two."

Once more: having had occasion recently to examine for certain statistical purposes several thousand intelligence-test blanks which had been used in the public schools of a well-known city, we speedily discovered that the tests in question had not always been correctly scored. There is nothing remarkable about this, of course, because errors in scoring are liable to appear in any set of test blanks, even when handled by well-trained persons. What was remarkable, however, was the frequency and extent of these errors, for of 20 unselected papers, 18 were wrong and to show the extent of error the five following illustrations are given:

Composite Score		Equivalent Mental Age	
As Reported	Corrected	As Reported	Corrected
77	88	13.0	14.3
61	76	11.5	13.1
95	87	15.0	14.2
141	149	19.5	20.5
60	70	11.5	12.5

The burden of our plea must be obvious. If we are to have a profession, let us have one; let us see to it that our training is thorough; let us recommend for work in the schools no one who does not know his job; let us frown upon amateurism and protest against the notion that anyone can be a psychologist and that anyone can be a research specialist in our schools.

G. M. W.

Reviews and Abstracts

ALMACK, J. C. AND LANG, A. R. *Problems of the Teaching Profession.* Boston, Houghton Mifflin Company, 1925. 325 pp.

These authors have compiled a useful handbook for young teachers in service. Seventeen problems with which all teachers should be familiar are discussed in chapters of about twenty pages each and in sufficient detail to give the inexperienced teacher some problems for consideration. The treatment is presented in simple, stimulating style which should lead to the further study of each problem.

The list of problems used includes data on teacher training and selection; professional ethics; teacher participation in administration; teacher improvement in service; the measurement of teaching efficiency; the teacher's load, tenure, salary, and pensions; and the teacher's community responsibilities. Each discussion deals fairly with the moot points of the problem, cites whatever scientific studies have been made in the field, and records tentative conclusions.

The book should be widely read and should materially aid new teachers by suggesting to them a scientific approach to the important problems which they must help to solve.

FREDERICK L. WHITNEY

Colorado State Teachers College

SEARS, JESSE B. *The School Survey.* New York, Houghton Mifflin Company, 1925. 440 pp.

Professor Sears reviews his own book:

The assumption is that there can be no intelligent administration, supervision, or teaching without: (1) a reasonably scientific determination of *aim* and *procedure;* followed by (2) a *critical evaluation of results obtained;* together with (3) an *interpretation of these results for future policies.* That is precisely what the survey is. It is further assumed that a modern school system must be continually in process of being surveyed, and that the teaching and administrative staff must in the main be the surveyors.

The School Survey is comprehensive. The first part considers the larger problems of administration; the second, internal administration and management; and the third, efficiency of instruction and supervision.

In the treatment of each of the bigger groups of problems the author describes the technique of collecting and the standards for treating objective evidence; but what is more important, he attempts to set up the fundamental

principles that should guide the surveyor in evaluating the situation as he finds it and the administrator in determining the future policy to be followed. Under the pretext of describing "how to make a survey" he has produced a volume devoted to a discussion of the fundamental principles of school administration. In this discussion of principles lies the value of the book.

One of its chief merits is the author's emphasis on the separate functions of staff and line organization as a fundamental principle in school administration. In the staff organization he would make a big place for educational research which he looks upon as a continuous school survey. Only in times of particular stress would he call in the expert from the outside to conduct a school survey, but he has left some one else to state the value of the survey by an entirely impartial, expert commission.

In no sense is this volume addressed to the school-survey expert. His chief interest in it will lie in the frequent allusions to problems needing further solution before an adequate survey is possible. It is actually addressed to two groups, the graduate student in school administration and the principals, supervisors, and superintendents on the firing line who wish to base their work on sound principles and objective evidence rather than on tradition and personal opinion.

J. CAYCE MORRISON

Ohio State University

MOEHLMAN, A. B. ET AL. *A Uniform Financial Procedure for the Public Schools of Michigan.* Prepared by the Committee on Uniform Child-Accounting and Unit Costs. Lansing, Michigan State Teachers' Association, 1924. 40 pp. (Bulletin No. 4, Part I)

In line with the meritorious and rapidly growing tendency in the various states, a uniform plan for budgeting and financial accounting has been recently introduced into the schools of Michigan. The plan has been worked out by a committee of the State Teachers' Association and consists of three parts. Part I, which is reviewed herewith, has been designed particularly for cities having a population of more than two thousand. The other two parts, designed for the smaller districts, will appear shortly.

The first few pages of the report are devoted to suggestions on how to prepare and present the school budget, while the later pages are devoted to outlining a scheme of financial accounting. The plans suggested are based largely, as are all of the uniform plans which the present reviewer has seen, on the well-known scheme devised several years ago by H. C. Case for the schools of New York State.

The plan seems to have been carefully worked out and ought to function splendidly in the schools of Michigan. Moreover, it ought to make an appeal to other states which may be considering the adoption of a uniform procedure in budget making and financial accounting. The sample budget and the suggestive accounting forms ought to be of interest to school executives everywhere.

WARD G. REEDER

Ohio State University

PAYNE, ARTHUR FRANK. *Administration of Vocational Education.* New York, McGraw-Hill Book Company, 1924. 354 pp.

There are texts—as the author says in substance in his Preface—that deal with the underlying principles of vocational education both as to its theory and administration; then again there are those that do not accomplish nor even attempt this. This text is clearly one of the latter type; and in the reviewer's judgment it is the less worth while for this very reason. It is a real question whether there is adequate justification for publishing a text which consists almost exclusively of laws and regulations.

It is true, to be sure, that the game is yet young so far as vocational education is concerned. It is likewise true that any attempt to apply bodily to vocational education the principles of administration that have served well in the field of general education may be open to serious criticism. But even so, this fails to justify, in the reviewer's opinion, the type of text under consideration, however well the contents may have been put together.

When one considers the needs of administrators of vocational work, the reason for this criticism becomes obvious. What they want, and want badly, is advice as to how to get results rather than a compilation of specified regulations which in some cases are, as they well know, reasonable and workable, in others decidedly not so. Such phases of the laws as the administrator must know and observe from day to day he readily secures from printed authoritative bulletins in a relatively short time. This is not to suggest that the text is not authentic, for undoubtedly it is. The careful administrator, however, will, it is safe to say, prefer to secure information as to reimbursement for his teachers' salaries from more direct, more immediate, and, what he considers, more authoritative sources. This compendium of information is well edited, and for the most part well organized.

D. J. MACDONALD

Ohio State University

KOOS, LEONARD V. *The Junior-College Movement.* Boston, Ginn and Company, 1925. 436 pp.

The junior-college movement, which is rapidly developing and already includes more than two hundred institutions, is an important part of the reorganization now taking place in American education. Because this movement is new and has developed under varying conditions in different parts of the country, there is variation in the objectives sought and in the types of institutions established. Professor Koos' book, which in a scholarly manner gives a clear and comprehensive account of this movement, is therefore timely. Both those directly interested in developing and in administering junior colleges and those desiring only a general knowledge of this recent educational movement will find this book valuable.

The facts used were obtained through an extensive investigation which Professor Koos made under subventions from the Commonwealth Fund of New York City and from the University of Minnesota. A two-volume report of this investigation was issued as one of the "Research Publications of the University

of Minnesota." With the advantage of this previous study, Professor Koos has presented in his book a comprehensive body of organized facts together with conservative and convincing interpretations.

Among the more important matters discussed are the scope and variety of the junior-college movement, the current conceptions of the special purposes of junior colleges, the important functions of these institutions, the curricula offered, the quality of instruction, the trend of reorganization in higher education, the overlapping in high school and college, the evaluation of various types of junior colleges, and the problems of locating and maintaining these institutions. The book contains forty-six diagrams and a selected bibliography.

University of Missouri J. H. COURSAULT

FRYER, DOUGLAS. *Vocational Self-Guidance.* Philadelphia, J. B. Lippincott Company, 1925. 385 pp.

Dr. Fryer has attempted to aid young men and women in their selections of life-careers. To this task he brings the materials of present-day psychology in the form of tests of mental ability and personality traits which may be self-applied, scored, and interpreted. In addition to aids in the "know thyself" phase of self-guidance he supplies analyses of some twenty major occupations, made by experts in their respective fields.

Throughout the book emphasis is rightly placed upon the importance of self-guidance, based on scientific principles of self-knowledge and vocational information. Dr. Fryer draws clear distinctions between science and pseudo-science, his rating scales and occupational levels, while based upon modifications of the Army Alpha Scale are in general improvements over the personnel scales employed in the army.

Those who make use of this book for self-guidance will find it both informative and helpful. Results in the self-testing of intelligence, however, will doubtless be found to be more reliable than results of the efforts to measure one's own traits of personality. The value of the attempts to measure traits of character and personality would probably be enhanced if one could induce several associates to fill out the charts, so that he could see himself somewhat as others see him.

The author's plan of self-guidance is admittedly for the use of the upper 25 percent in intelligence—the "A" and "B" men and women—and would yield very little in returns to the 75 percent who occupy the C+, C, D, and D— levels of mental ability. It will, however, be full of suggestive material for guidance counselors, who of necessity must seek to help all "sorts and conditions of men," and who need all the aids which science can supply or which practical common sense can suggest.

Stanford University WILLIAM M. PROCTOR

ODELL, C. W. *Educational Statistics.* New York, Century Company, 1925. 334 pp.

Four different publishing houses brought out new books on statistical methods in education during the first half of 1925. Before attempting to

evaluate a volume in this field it should be worth while to formulate clearly the reviewer's conception of the purpose of statistical calculations and of the aims that a handbook in statistics should serve.

The essential purpose in all statistical calculations is to clarify and simplify masses of data. The human mind cannot grasp at any one instant more than a limited number of unorganized items of information. The memory span of the normal adult is so limited that only above seven unrelated digits can be retained and repeated after a single exposure, although larger numbers of digits can be repeated if they have been presented in related groups or patterns. It is the function of statistical methods to reveal the patterns and the relationships that exist among masses of data in order that the significance of the facts may be easily recognized by any normally intelligent person. Graphic representations and index numbers obtained by statistical processes are intended to reveal the true significance of measures which in their unorganized state may convey even to the most brilliant minds almost no meaning whatever.

A general handbook of statistics for the use of American teachers and school administrators should be written in a language which any high-school graduate could understand, should include discussions of all the statistical measures which have proved most useful in educational work, and should provide an adequate list of references to which a thoughtful student might turn for further illustrations or explanations of each process.

Odell's book seems to the reviewer to have been written with a clearer conception of the purpose of statistical work and to meet more adequately the statistical-handbook requirements of educational workers than any other volume yet published. It is not as mathematically exhaustive as Kelley's *Statistical Method*, but it is full and clear, and it treats satisfactorily every index or coefficient which has thus far been found to be important in educational research. It is doubtful, for example, whether there are in the English language simpler expositions than those given here of partial and multiple correlations and regressions, bi-serial coefficients, and tetrachoric correlations. The reviewer was a bit disappointed in the brief treatment given the matter of graphic representations, but several excellent handbooks in that part of the field are already available. The educational fraternity is to be congratulated on the publication of this excellent handbook of statistics.

M. R. TRABUE

University of North Carolina

Publications Received, December 15 to January 15

Aldredge, E. M., and McKee, J. F. *Word classifying motivated by stories; for upper second, third, and fourth grades.* Cleveland, Ohio, Harter School Supply Co., 1925. Per set, $.40.

Bagster-Collins, E. W. *First German reader.* New York, Holt, 1925. 164 pp. $1.00.

Branom, M. E. *The measurement of achievement in geography.* New York, Macmillan, 1925. 188 pp. $1.25.

Burkard, W. E., and others. *Health habits.* Chicago, Lyons & Carnahan, 1925. Book I, Practice. $.72. Book II, Physiology and hygiene. $.75.

Burt, Cyril. *The young delinquent.* New York, Appleton, 1925. 619 pp. $5.00.

Caesar's Helvetian war. Ed. for the use of beginners by W. Welch and C. G. Duffield. New York, Macmillan, 1925. 112 pp. $.48.

Caesar's invasion of Britain. Ed. for the use of beginners by W. Welch and C. G. Duffield. New York, Macmillan, 1925. 106 pp. $.48.

Clement, J. A. *Principles and practices of secondary education.* New York, Century, 1925. 503 pp. $2.50.

Coindreau, M. E., and Lowe, L. F. H. *French composition book.* New York, Holt, 1925. 361 pp. $1.68.

Conover, Milton. *Working manual of civics; the project method applied to the socialized recitation.* Baltimore, Johns Hopkins, 1925. 88 pp. $.75.

Cooke, E. V. *Going thru the zoo.* Cleveland, Ohio, Harter School Supply Co., 1924. Per set, $.25.

Courtis, S. A. *Why children succeed.* Detroit, Mich., Courtis Standard Tests, 1925. 271 pp. $1.50.

Crawford, Caroline. *Choice rhythms for youthful dancers, a collection of folk melodies.* New York, Barnes, 1925. 103 pp. $3.00.

Edgerton, E. I., and Carpenter, P. A. *Advanced algebra.* Boston, Allyn, 1925. 377 pp. $1.40.

Espinosa, A. M. ed. *Cuentos, romances y cantares.* Boston, Allyn, 1925. 129 pp. $.80.

Ferenczi, Sander, and Rank, Otto. *The development of psycho-analysis.* Trans. by Caroline Newton. Washington, Nervous and Mental Disease Pub. Co., 1925. 68 pp. (Nervous and mental disease monograph series, no. 40) $3.00.

Goldstein, Florence. *The color builder; seatwork for primary grades.* Cleveland, Ohio, Harter School Supply Co., 1924. Per set, $.50.

Harter's large letter cards in strips. Cleveland, Ohio, Harter School Supply Co., n. d. Per set, $.15.

Hunt, H. E. *The living touch in music and education.* New York, Dutton, 1924. 224 pp. $2.00.

Jackson, V. E. *Labour-saving office appliances.* London, MacDonald & Evans, 1925. 218 pp. 4*s.*

Joad, C. E. M. *Mind and matter.* New York, Putnam, 1925. 204 pp. $2.00.

Johnsen, J. E. *Academic freedom.* New York, Wilson, 1925. 110 pp. (The reference shelf. Vol. 3, no. 6) $.90.

Johnson, D. H., and Myers, G. C. *The toy store; arithmetic seatwork for second and third grades.* Cleveland, Ohio, Harter School Supply Co., 1925. Per set, $.40.

Klapper, Paul. *Teaching children to read.* New York, Appleton, 1926. 304 pp. $1.60.

Machen, J. G. *What is faith?* New York, Macmillan, 1925. 263 pp. $1.75.

Meek, L. H. *Guidance materials for study groups; how children build habits.* Washington, Amer. Assn. of Univ. Women, 1925. 99 pp. $.25.

Methods and problems of medical education. New York, Rockefeller Foundation, 1925. 3 vols. (Series 1-3)

Mills, F. C., and Davenport, D. H. *Manual of problems and tables in statistics with notes on statistical procedure.* New York, Holt, 1925. 203 pp. $1.90.

Moehlman, A. B. *Public education in Detroit.* Bloomington, Ill., Public School Pub. Co., 1925. 263 pp. $2.00.

Morrison, B. M. *A study of the major emotions in persons of defective intelligence.* Berkeley, Calif., Univ. of Calif., 1924. 73 pp.

Morton, G. F. *Childhood's fears; psycho-analysis and the inferiority-fear complex.* New York, Macmillan, 1925. 284 pp. $1.80.

Mother Goose posters to color. Cleveland, Ohio, Harter School Supply Co., 1925. Per set, $.35.

Müller, Margarethe, and Wenckebach, Carla. *Glückauf, a first German reader.* Boston, Ginn, 1925. 303 pp. $1.20.

Myers, G. C. *The grocery store; arithmetic seatwork for second or third grade.* Cleveland, Ohio, Harter School Supply Co., 1925. Per set, $.40.

O'Brien, J. A. *Reading: its psychology and pedagogy; a summary of experimental studies in reading.* New York, Century, 1926. 308 pp. $2.00.

Peel, A. J. *Simplified school accounting.* Milwaukee, Bruce Pub. Co., 1925. 118 pp. $1.35.

Pierce, Frederick. *Understanding our children.* New York, Dutton, 1926. 198 pp. $2.00.

Pressey, L. C., and Pressey, S. L. *Methods of handling test scores.* Yonkers-on-Hudson, N. Y., World Bk. Co., 1926. 60 pp. $.60.

Pressey, S. L., and Pressey, L. C. *Initiation a la méthode des tests.* Trans. by R. Duthil. Paris, Librairie Delagrave, 1925. 262 pp. 12 fr.

Reed, Maud. *Julia; a Latin reading book.* New York, Macmillan, 1925. 98 pp. $.48.

Reeder, W. G. *How to write a thesis.* Bloomington, Ill., Public School Pub. Co., 1925. 136 pp. $.90.

Ridgley, D. C. *Geographic principles, their application to the elementary school.* Boston, Houghton, 1925. 189 pp. $1.20.

Roantree, W. F., and Taylor, M. S. *Arithmetic for teachers.* New York, Macmillan, 1925. 621 pp. $2.50.

Robbins, C. L. *School history of the American people.* Yonkers-on-Hudson, N. Y., World Bk. Co., 1925. 606 pp. $1.72. Also outline chart of American history for seventh and eighth grades or junior high school.

Rohrbach, Q. A. W. *Non-athletic student activities in the secondary school.* Philadelphia, Westbrook Pub. Co., 1925. 233 pp. $2.00.

Silent teacher of addition. Cleveland, Ohio, Harter School Supply Co., 1924. Per set, $.60.

Swift, F. H., and others. *Studies in public school finance: the middle west, Illinois, Minnesota, South Dakota, with a supplement on Alaska.* Minneapolis, Minn., Univ. of Minn., 1925. 329 pp. (Education series, no. 3). $3.50.

Thomason, J. F. *Foundations of the public schools of South Carolina.* Columbia, S. C., State Co., 1925. 237 pp. $2.00.

Ward, C. H. *What is English?* Rev. ed. Chicago, Scott, Foresman, 1925. 487 pp. $1.60.

Whipple, G. M., and Davis, Helen. *Problems in mental testing; with special reference to the administration of group intelligence testing.* Bloomington, Ill., Public School Pub. Co., 1925. Unp. (The educational problem series, no. 9) $.75.

Whittaker, W. G. *Class-singing.* London, Oxford, 1925. 136 pp. $2.00.

Williams, Whiting. *Mainsprings of men.* New York, Scribner, 1925. 313 pp. $1.50.

Wilm, E. C. *Theories of instinct.* New Haven, Conn., Yale, 1925. 188 pp. $2.50.

Wood, T. D., and Brownell, C. L. *Source book in health and physical education.* New York, Macmillan, 1925. 590 pp. $2.50.

Woodbury, C. H., and Perkins, E. W. *The art of seeing: mental training through drawing.* New York, Scribner, 1925. 290 pp. $2.00.

Worst, E. F. *Worst's primary word builders.* Chicago, Flanagan, 1925. Per envelope, $.20.

Worst, E. F. *Worst's weather record cards for primary grades.* Chicago, Flanagan, 1925. Per envelope, $.20.

Yeaxlee, B. A. *Spiritual values in adult education.* London, Oxford, 1925. 2 vols. $8.75.

News Items and Communications

This department will contain news items regarding research workers and their activities. It will also serve as a clearing house for more formal communications on similar topics, preferably of not more than five hundred words. These communications will be printed over the signatures of the authors. Address all correspondence concerning this department to Doctor E. J. Ashbaugh, Ohio State University, Columbus, Ohio.

The school year in Czechoslovakia will consist of 230 days according to the schedule recently fixed by the Ministry of Education.

A twelve-months public-school session in Arlington County has been authorized by the Virginia State Board of Education.

One-sixth of all the expenditures of the Republic of Cuba during the coming fiscal year will be devoted to education. In the budget of Guatemala 18.5 percent is allotted to education and 7 percent in that of Mexico.

On a five-mill school tax, Fulton County, Georgia, could spend $19.50 annually on the education of each child of school age, but Coffee County could spend only $1.96.

A study of consolidated and one-room schools in Connecticut shows that 29 percent of the pupils fourteen years of age in one-room schools drop out during the school year but only 8 percent in consolidated schools. For fifteen-year-olds, the figures are 41 percent and 12 percent, respectively.

The graduate faculty of Yale University announces the Sterling Fellowships for research in humanistic studies and the natural sciences which have been established by the gift of a million dollars from the estate of the late John W. Sterling.

Candidates for research for senior fellowships must have the Ph. D. degree or such training and experience as are indicated thereby. Candidates for junior fellowships must be well advanced toward the Ph. D. degree. The stipends for the former range from one thousand to twenty-five hundred dollars and the latter from one thousand to fifteen hundred dollars. Applications for fellowships should be addressed to the Dean of the Graduate School, Yale University.

A score card for the measurement of the recitation, devised by Dr. J. T. Giles, state supervisor of high schools for Wisconsin, has been published by the World Book Company of Yonkers, New York. The purpose of the score

card is to provide a means for giving definite numerical rating to the recitation. The card may be used either by the principal, superintendent, supervisor, or teachers. Self-rating by the teachers is one of the primary uses of the card. The different factors to be measured are: the arrangement of physical and personal surroundings, the arrangement of immediate conditions for learning, the use of ideas and tools by the pupils, the use of the English language, and the attitudes of teacher and pupil.

Dr. I. O. Foster, director of the Summer Session of Battle Creek College, Battle Creek, Michigan, announces as a part of the Summer Session of his institution for the coming year a plan that may be of interest to some of our readers. An opportunity is given to a number of professors who have attained national reputation or who have made distinctive contributions in the various fields of education to spend their summer at Battle Creek College, in the "Little Lake District" of Michigan and to receive all expenses and free treatment from the Battle Creek Sanitarium in return for teaching one or two classes in the College.

The Godsey Latin Composition Test has lately been issued by the World Book Company. This test makes a double use of the multiple-choice technique. In the first place, the English form of a Latin sentence together with the corresponding Latin sentence is given. But the Latin sentence offers four ways of expressing one of the ideas given in the English sentence. Three of these ways are wrong. The pupil is to select the right one.

For example:

The leader's messengers are brave.

Ducis (nūntius, nūntiōs, nūntiī, nūntiōrum) fortēs sunt.

Here the pupil is supposed to select *nūntiī*.

In the second place, the pupil must also show that he knows the rule of grammar which applies to this construction. At the bottom of the page on which the foregoing occurs there are sixteen rules of grammar. The numbers of four of these rules, including the one applicable to the particular question, are printed beside the question. The pupil is to "draw a circle around the number of the rule which applies to the correct form."

A study of the cheating problem in high school was made this past year by Miss Lillian Dyer in Alva, Oklahoma. The following questionnaire was submitted to 70 students, 35 Freshmen and 35 Seniors. The two divisions were made thinking that some differences in the judgment of the groups would offer a phase for further study and investigation. Significant differences, however, were not revealed. The questionnaire was as follows:

1. Do you consider that it is wrong to cheat in school? Why?
2. What causes would you give for the amount of cheating that is done in Alva High School?
3. In what subjects do you think cheating is most prevalent? Why?
4. Have you ever had a teacher under whom you would not cheat? If so, what reasons would you give?
5. Which of the following probable causes for cheating do you think are most common in your classes:

1. Difficult subject
2. Lack of interest
3. Lack of preparation
4. Unreasonable assignments
5. Desire to maintain standard as "A" student
6. "Everybody else does it"

6. Have you ever cheated in school? If not, give reasons

Sixty-six of the 70 say it is wrong to cheat; 5 because it is dishonest; 14, unfair to themselves and others; 17, nothing to be gained by it; 11 a moral wrong, weakening character, etc. Of the 4 who answered in the negative one says it is not wrong to cheat if you are not getting a square deal, and two indicate that it depends upon conditions.

Among the reasons for the amount of cheating, 23 state lack of preparation; 16, a desire to make good grades with little or no effort; 10, the teachers cause it by being unreasonable; 8, because of lack of interest in school.

English and mathematics seem to have the lead as subjects in which cheating is most prevalent with 31 votes each. English leads with Seniors and mathematics with Freshmen. Cheating is most common in English they say, because of long lessons, so much memory work, and the ease of copying notebooks and book reports, while mathematics is responsible for much cheating because it is difficult and teachers do not explain fully. The ease of copying also comes in for its share of responsibility in mathematics and history as well as English.

Fifty-eight of the 70 students say they have had teachers under whom they would not cheat, and the comment accompanying would lead one to believe that the teacher holds the key to the cheating situation to a very great degree. Teachers who were honest, who trusted the students, who gave what was earned and were always ready to help, skillful teachers who made reasonable assignments were likely to have a relatively small amount of cheating among the students. To Question 5, the votes were as follows: difficult subject, 28; lack of interest, 21; lack of preparation, 34; unreasonable assignments, 19; desire to maintain standard as "A" student, 16; everybody else does it, 22.

On the last question, "Have you ever cheated in school?" 63 replied in the affirmative; 4 in the negative; and 3 did not answer.

Partial Correlation and Marginal Thinking

In reading the current literature of our profession one is struck with the idea that there still exist certain serious errors in our educational thinking which operate to make it unscientific. Seemingly we have made such advances in recent years as to lead us to expect only critical thinking at least in our better educational journals. Our time is too valuable to have it taken with reading reports and articles which have not been subjected to the crucible of thorough criticism before publication.

We have been quick to tell the character analyst that he could just as well do his analysis without using his highly advertised devices and technique, and that probably he actually ignores them anyway. It has been well pointed out in testing programs that growth in a given skill has often been wrongly attributed to the drill given between tests, when an equal growth might have

occurred by mere virtue of the maturing process of the individual, had no drill been given. In both political and educational thinking, we have long since discarded the assumption, *post hoc ergo propter hoc*.

But in current consideration of different methods or techniques in a given subject, one notices a surprising lack of recognition of what may be called the varying concomitants of the situation. We jump to conclusions with an haste and an air of finality equalled only by the wholeheartedness of later repudiation. For illustration, take the current discussion of the relative merits of different methods of teaching subtraction. A school adopts a new method of teaching subtraction, secures improvement, and attributes the latter to the new method perhaps without further question. But careful inquiry into the situation may disclose sufficient explanation for all the improvement secured by totally different factors. For instance, before a school adopts a new method of teaching anything, it is highly probable that the superintendent, supervisor, teacher—one or all—have by some circumstance been made aware of a weakness or of unsatisfactory results or of previous neglect or lack of emphasis or of what not in the particular subject. Some one has awakened to the existence of a problem in the teaching process. This some one is likely to be the teacher who does the teaching sooner or later. Obviously, some such factors are bound to accompany almost any trial of a different method, and certainly must often be responsible for the improvement secured. In other words, other factors than the one getting the credit have often been responsible for the improvement of results.

Such factors are admittedly often extremely difficult if not impossible to bring under control in a teaching experiment. It is obviously beyond hope to hold constant the attitude of the teacher during the trial of a new method. But it would seem that the day approaches when no one has much right to play with educational research, expensive as it is for all concerned, unless he is aware of all the best techniques available and applicable to such work. Those factors which can be isolated should be subjected to treatment by the technique of partial and multiple correlation, and hence many spurious correlation conclusions avoided. Those factors which cannot be brought under control and given statistical treatment, can at least be recognized as such and due allowance made for them in our marginal thinking as well as by exercising greater hesitation in announcing final conclusions.

College of Education, State University of Iowa O. S. LUTES

Practice and Study Materials

An interesting development, indicated by recent publications, is that of supplying pupils with practice materials which are to be used to supplement the regular test. Up to the present time the majority of these practice materials have been prepared for the elementary grades. It is undoubtedly true that the high-school pupil who has had experience in studying for himself will also be helped to a large degree by similar materials.

Three such publications have appeared, the first, practice tests in geography by Dr. M. E. Brannom, is published by Macmillan Company. The practice tests are bound into a substantial tablet, one of which is to be the per-

sonal property of each pupil. While studying a given section of a country the pupil is asked to answer a large number of questions which include place geography, the application of geographical principles, commerce, industry, and other important matters related to human geography. Objective means have been employed for the scoring of these tests. For example, some of the exercises are as follows: (1) Questions such as "Which state leads in the fishing industry?" (2) True and false exercises such as, "Tobacco is a special crop of Merrimac Valley." (3) Map exercises where the location of a city or river is indicated by a number. (4) Matching tests which involve placing the number of a product before a given city or state. (5) Completion exercises as, "Most of the copper mined in these states comes from the state of ———."

A similar set of exercises has been devised for use in arithmetic. It is called the *Arithmetic Work-Book for Grade IV* and has just been published by Scott, Foresman and Company. This book was written under the joint authorship of Doctors G. M. Ruch, F. B. Knight, and J. W. Studebaker. Similar work-books have also been developed for grades V and VI. The work-book for grade IV contains much helpful material and many aids for the pupil. A large amount of the pupil's work is written in the booklet, which means that each pupil must have his own copy. Carefully constructed drill exercises and tests are included. The readers will obtain some idea of the book by noting the contents of one lesson. Lesson 1 includes the following headings: (1) Things to watch in addition, (2) Practice in column addition, (3) Things to watch in subtraction, (4) Practice in subtraction, (5) Things to watch in multiplication, (6) Practice in multiplication, (7) Multiplying by 10, 20, 30, etc., (8) Practice in multiplying by 10, 20, 30, etc.

Materials for reading in the elementary grades have also been provided by Dr. William A. McCall and Lelah Mae Crabbs. Two booklets have been published, one for the third grade and the other for the fourth grade. The materials are called *Standard Test Lessons in Reading* for grades III and IV. These are published by Teachers College, Columbia University. Some of the purposes of these test lessons are: (1) to teach pupils how to comprehend rapidly all kinds of reading materials, (2) to help them enjoy their reading lessons, (3) to make it easier for them to learn other lessons, (4) to indicate automatically their proper grade classification in reading, (5) to motivate and improve their oral expression, (6) to prevent the dull pupils from becoming discouraged and the bright pupils from loafing, (7) to save time.

A Test of Health Knowledge

Occasional test items relating to health have been included in achievement tests, but no comprehensive test of the knowledge relating to this important objective of education has been made. Two years ago, the authors, assisted by funds contributed by the American Child Health Association, undertook the construction of objective tests for appraising knowledge in this field. The methods utilized in constructing these exercises may be of interest to readers of the JOURNAL.

The health information useful for school children was determined by a statistical study. Twenty recent and approved courses of study, covering the field from kindergarten through high school, and fourteen recent and widely used textbooks on health were analyzed in detail. Facts given in all of these sources

were recorded and the frequencies of each where determined ranged from 50 to 1. Facts, mentioned three or more times and others which a group of experts considered highly important because of very recent information, were accepted and for each of these facts a test exercise was made. The exercises were all of the following form:

In order to sleep well we should if possible
..... eat a big meal just before going to bed
..... sleep with somebody
..... sleep with the windows closed
..... go to bed in a dark, quiet room
..... play exciting games just before bed time.

The exercises when completed were criticised by an expert in health education and by two or more experts in the field of test construction.

All the exercises were given to about 350 children—this required about 8 or 9 forty-minute periods of work by each pupil—in grades III to VIII, and to 35 college students in a class in health education. Individual responses to every item of every exercise were recorded and studied. As a result of this study some of the exercises were revised and again submitted to the children.

The exercises classified under types of professional or scientific specialization, such as care of the teeth, diet, and mental hygiene, were submitted to authorities in the field for criticism concerning the importance, accuracy, or completeness of the information represented, and the merits of the exercises as tests. Several of the exercises were disregarded on the basis of an expert's statement that "the facts were unknown," for example, the causes of anemia, and for other good reasons. In the final list are included 520 exercises, covering fairly well the facts in health education and demonstrating their importance by satisfying the demands of foregoing criteria.

These test exercises will be available in two forms and may be secured from the Bureau of Publications, Teachers College, New York City. The entire series arranged in order of difficulty under each of eleven topics, together with a description of methods of construction and their uses for schools, was published in November. Form I of the test booklet, already in circulation, is accompanied by a separate sheet of directions which contains 64 exercises, increasing in difficulty, for use in grades III to XII.

The difficulty of each of the 520 exercises, based on the average percent of three hundred fifty pupils in grades III to VIII, is printed with the published list. This makes it possible to make up for informal testing, any desired combination of easy or hard, medium or mixed difficulties, all on the same or on different topics. In other words, we have accomplished for the facts of health education what has been done for no other school subject except spelling, namely, we have made a comprehensive survey of the whole field, showing the selection of the most important items and the arrangement of test exercises of which the difficulty of each is known.

It should be added, however, that because of the great difference in methods of teaching health knowledge in American schools this scale of difficulty should not be considered as a fixed standard or norm. More stable standards can be procured only when the teaching of the subject approaches a greater degree of uniformity.

ARTHUR I. GATES
RUTH STRANG

Teachers College, Columbia University

The October 15 issue of the *Educational Research Bulletin*, Ohio State University, has proved to be the most popular of all the bulletins which have yet been issued in spite of its number being 13. The issue is devoted to "Remedial Arithmetic" and is filled with suggestions and devices worked out by a group of Columbus teachers under the direction of Dr. P. R. Stevenson. So great has the call been from superintendents over the country for additional copies to be used in supervisory meetings and as direct aids to their teaching force, that a second edition of three thousand copies was printed. A few copies of the Bulletin are still available.

The *New York Sun* sometime ago quoted Professor J. F. Hosic of Teachers College, Columbia, as cautioning against the leveling influence of the single salary schedule.

> Human nature being what it is, we have good reason to suppose that the single salary schedule will tend to become automatic. Once the principle is established that high-school and elementary-school teachers are equal, why not all teachers, irrespective of merit, length of service, or preparation?
>
> Few school administrators at present are endeavoring to definitely reward merit, because it is extremely difficult to evaluate. It is true that many school systems have failed to differentiate between academic and professional training. That length of service and amount of preparation will be entirely neglected is hardly conceivable in the face of the fact that the teachers themselves are the most strenuous proponents of these differentiating factors.